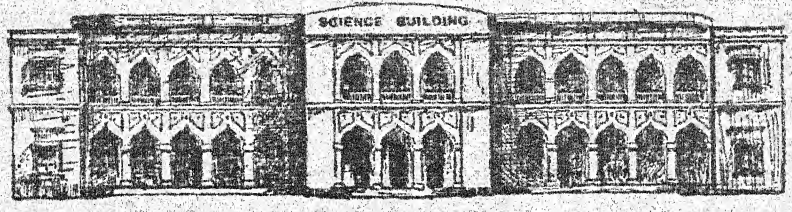
THE ALLAHABAD FARMER



PUBLISHED QUARTERLY

Undenominational in Scope and Interests.

Vol. IV **OCTOBER, 1930** **No. 4**

CONTENTS :

Editor : W. J. HANSEN, B. S. A., M. Sc.

Published by : The Agricultural Institute, Allahabad, U. P. India.
American Presbyterian Mission.

Annual Subscription : Including Postage, in India, Rupees 2.

Annual Subscription : For other countries, $1-00 or 4sh. Special rates for Students.

Advertising Rates : Upon Application.

The Editor does not hold himself responsible for opinions expressed in the contributed matter.

The Mission Press, Allahabad.

THE
ALLAHABAD FARMER

VOL. IV.] OCTOBER, 1930 [No. 4

IF

If you can keep your head when all about you
Are losing theirs and blaming it on you,
If you can trust yourself when all men doubt you,
But make allowance for their doubting too,
If you can wait and not be tired by waiting
Or being lied about don't deal in lies,
Or being hated don't give way to hating,
And you don't look too good, nor talk too wise :

If you can dream—and not make dreams your master,
If you can think—and not make thoughts your aim,
If you can meet with Triumph and Disaster
And treat those two imposters just the same ;
If you can bear to hear the truth you've spoken
Twisted by knaves to make a trap for fools,
Or watch the things you gave your life to, broken,
And stoop and build'em up with worn-out tools :

If you can make one heap of all your winnings
And risk it at one turn of pitch and toss,
And lose, and start again at your beginnings
And never breathe a word about your loss ;
If you can force your heart and nerve and sinew,
To serve your turn long after they are gone,
And so hold on when there is nothing in you
Except the will which says to them ; " Hold on ! "

If you can talk with crowds and keep your virtue,
Or walk with kings—nor lose the common touch ;
If neither foes nor loving friends can hurt you ;
If all men count with you but none too much,
If you can fill the unforgiving minute
With sixty seconds' worth of distance run,
Yours is the Earth and everything that's in it,
And (which is more)—you'll be a Man, my son !

RUDYARD KIPLING.

THE PRINCIPLE OF CO-OPERATION.*

SIR RABINDRA NATH TAGORE.

In certain stages of civilisation, cities automatically become more important than villages. Not that a nation's life blooms brighter in a city; its power is better organised there and that is what it glories in.

Sociability which is the essence of a human community can never crystallize in cities. For one thing, the greater magnitude of a city tends to make the social tie rather loose-knit, and for another, the satisfaction of material needs rather than a realisation of human values is the pre-occupation of the huge crowds who are brought together in a city by the urge of commerce and trade, and the lure of its many facilities.

Thus, not knowing his neighbours is no discredit to a city-dweller. As life becomes increasingly more complex the gulf that divides one individual human being from another tends to become ever wider. I remember to have seen in my childhood our nighbours mixing freely with our family. They came to our pond for bathing and to our garden for air, where there was nothing to prevent them from plucking flowers for daily worship. They would take their seat in our verandah and demand a whiff of tobacco-smoke without the least hesitation. They felt they had the right to help and participate in the ceremonial dinners and festive occasions of our family. Buildings of those days had halls opening on to a number of courtyards. This arrangement not only facilitated the passage of light and air, but also made for the free access of people in general. In the midst of their own necessities, men had to make room for others needs: one was not to use one's entire wealth exclusively for one's own enjoyment. A rich man's storehouse had two entrances, one for himself and the other for society. *His fortune was inextricably bound up with the fortunes of those round him.* A ceremony was merely an occasion for acknowledging every body—uninvited—as a member of one's own household.

This shows that in point of social character our towns greatly resembled our villages even in the recent past and whatever difference there was, was more in appearence than in reality. Beyond all doubt, our ancient cities must have been of this class. In spite of their civic pride, they acknowledgd their kinship with villages. It was more or less like the outer and inner sections of an aristocratic household, wealth and show in the outer, leisure and comfort in the inner; with an open door of cordial relationship between the two.

*United Provinces Co-operative Journal, Volume 6. No. 4.
Bengal Co-operative Journal, Volume 15, No. 2.

That things are far otherwise now is quite apparent, within the last fifty years, almost before our eyes, cities have become exclusively cities with even their backdoors barred against all communication with villages. This is what may be called "making a strange land of one's own courtyard." All about a city, so close to it, the villages are still there, but yet how far apart!

This unnatural discord can never be for the good of man. It needs pointing out that this is by no means a feature peculiar to our country in the present times; it is the common denominator of the modern age all the world over. In fact, germs of this social antagonism, carried by Western winds, have been scattered all over the world, not only endangering the peace and happiness of mankind, but threatening to destroy life at its very source. And the whole world is face to face with this problem today.

Civilisation, as conceived in the West, means the sapping of the common life to concentrate on certain special functions—like the flowering of the bamboo which exhausts its entire vital force. Specialisation, in course of its growth, becomes lop-sided, its accentric weight cracks the whole edifice with the inevitable consequence of a final crash. Europe reveals her cracks in her various social disturbances. The Ku-Klux-Klan, Bolshevism, Fascism, the Labour revolt, sex-rebellion,—these movements are indications of the loosening of the social bund in European life.

Modern civilisation is based on exploitation.—The minority exploits the majority that it may prosper like a parasite. A privileged few are inflated at the expense of the countless many who eke out a miserable, starved existence. The inevitable result is a sharpening of the sense of self-interest which is utterly unsocial.

I have already said that cities are the centres of power in a land, and villages are its centre of life. For the exercise of political, economic or democratic power, special conditions and regulations are necessary. *The conditions are anti-social and the regulations are dominated by a mechanistic rather than a humanistic, principle.* Power comes to him who can obtain control of this mechanical arrangement. For this reason, a city, generally, is a field of competition where co-operative tendencies cannot be properly encouraged and fostered.

Self-interest and competition are necessary for the growth of power. But they become fatal as soon as they overstep their proper limits. In modern civilisation these limits have been left far behind. The civilisation of today is many limbed, and so a huge preparation, involving expenditure of money on a lavish scale, is necessary to keep it alive and going. Based as it is on an immensity of materials, thinness of resources is almost a crime to it, and material poverty is its greatest obstacle. Learning and

health, recreation and roads, courts and conveyances, food and furniture, war and peace—everything is prohibitively costly. The poor are constantly insulted by it as poverty constantly impedes its progress.

Wealth, therefore, is the source of all influence and hence most coveted. In fact, modern diplomacy is actuated not by prospects of political domination but a hankering after commercial expansion for the accumulation of wealth. In olden days when civilisation was less complex, the learned, the cultured, the heroic, the charitable, the illustrious received a homage which the merely rich could never aspire to and true human worth was thus accorded an honour that was its due. For the money grabber, there was only popular contempt. But modern civilisation is a parasite on wealth. *So wealth is not merely sought, it is worshipped.* All the world over we find evidence of the fact that the worship of false gods destroys the good sense of man. Never before has man been so intensely inimical to man, because there is no passion so cruel and unjust as greed. The motive power of modern civilisation is greed and preparations for its satisfaction far outstrip any other form of human activity.

But there is no getting away from the bitter truth that greed leads to sin and sin to death. As a disruptive tendency, greed serves to weaken the social tie, and brings in its train a series of discords and a restlessness that can never be cured, leading finally to a division and dissolution of social integrity.

An interminable conflict between the possessors and producers of wealth is raging in the West today. Reconciliation seems to be an impossibility, for the greed of the man who supplies wealth is not a whit less than the greed of him who accumulates. Both feel the imperative need of abundant spare money for a satisfactory enjoyment of civilised life. Such being the case, a definite conclusion of this economic tussle is more than what can be reasonably expected.

In a society in which the urge of greed and the adoration of power assume dangerous proportions—whatever may be the reasons,—man's mind is turned away from the path that leads to an all-round self-realisation. He desires to be strong rather than self-complete. This is a state of things which greatly promotes the preponderance of cities to the utter neglect of villages. All comfort, all convenience, all manner of enjoyment are concentrated in cities. The sole function of villages is to provide cities with sustenance and in return for this slave-like service, they are suffered to lead a mean and subordinate existence. Society is thus sundered into two sharply-contrasted sections of light and darkness. The city-bred civilisation of Europe thus also divides individual wholeness. Ancient Greek civilisation was fostered

mainly in the cities, and on account of the wide gulf between masters and helots, it declined after a brief period of splendid efflorescense. Ancient Italy was essentially urban and she vehemently pursued power for a time. Power is by nature anti-social, creating as it does a sharp division between the possessors of power and their agents. Thus a limited number of men—as masters—live like parasites on a large number of men who are no better than slaves, and parasitism saps the foundation of all human values.

The Western nations, under the urge of their city-bred civilisation, are dividing human society into two anti-thetical sections of light and darkness, not only at home but all over the globe. The extent of their desires are so vast that it is impossible to meet them within their rightful jurisdictions. Englishmen have to exploit India to maintain that costly standard of living which is supposed to be indispensable to civilisation. To relinquish India means lowering the standard of their pampered line civilisation. England is in indispensable need of subject-nations for the realisation of the power she aims at. This explains why the British like parasites on India today. This also explains why the major powers of Europe are eager to parcel out Asia and Africa among themselves. Otherwise their overfed civilisation will have to starve. The parasitism of the minority on the majority in Europe itself is due to the same reasons. The means to excessive enjoyment cannot be equally distributed amongst all; if the few are to be inordinately rich, the many must be deprived of their dues. This problem in its most aggressive form offers itself for solution in modern Europe. At the root of the conflict between labour and capital lies the organised longing of both for unrestrained enjoyment. It has created as great a difference between capitalists and workers as between the ruling nations and the ruled. Such extreme inequality is in conflict with the noblest ideals of humanity. Destructive forces generate and gather openly or in secret, wherever human unity is thus threatened. So a master may openly injure the slave, but the slave, in annihilating his sense of truth and justice, strikes, indirectly, a more fatal blow. For physical want may kill the brute: it is spiritual bankruptcy that leads to the downfall of man.

The arrow that killed the one-eyed deer of Æsop's Fables was shot from the direction in which it had turned its blind eye. The aspect of acquisitive materialism is the blind side of modern civilisation. Curiously enough, inspite of this ruthless competition in the economic sphere, we find in Europe in its intellectual field a vast and varied co-operation. In consequence, the lamp of European intellect, burning in a thousand flames, has cast a dazzling brilliance on the modern age. Through her culture,

Europe now leads the other continents. Her peoples are the priests in the cultural situation of today, and the fuel they have gathered from all quarters for the sacred fire is so immense in quantity that the fire promises to burn for ever. Never before in the history of mankind has cultural co-operation been practised on such an extensive scale. Formerly, nations used to evolve their own cultures, each independently of the rest. Greek, Latin, Indian, Chinese, all these different cultures bear out the fact. Fortunately, the countries of Europe are of close contiguity; their natural barriers are not insuperable; they are not sundered by far-stretching deserts and high-climbing mountains. And then there was a time when a single religion dominated all the countries and, what is more, had for a long time its only centre in Rome.

Again, for centuries, Latin was the only medium of instruction in the European countries. The cultural unity of Europe is built on the basis of religious uniformity. The special characteristic of this religion is also unifying, *love being its central principle and service to humanity its supreme injunction.* Afterwards, the European countries outgrew the period of Latin tutelage and started evolving their own cultures through their vernaculars. But inspired by a spirit of co-operation, the different cultures followed similar lines and accumulated their achievements in the same treasure-house. The result is the western civilisation—the civilisation of intellectual co-operation in which numerous functions have been harmonised into one living organism. We often speak of Oriental civilisation but it is not based upon the intellectual co-operation of Asiatic countries. It is only non-European. Otherwise, the culture of Arabia is not only different from Chinese culture, it is in many respects antagonistic. Inwardly and outwardly, the culture of the Hindu in India is in sharp contrast with the culture of the Semetic in Western Asia. Their intellectual wealth has been stored up in separate treasuries. Lacking the cultural co-operation of the West, the history of ancient Asiatic civilisation is divided into different disconnected chapters. It is true here and there there have been some give-and-take due to forces whose explanation is to be sought in the facts of history; but the intellect of Asia has never assumed one organic form. So when we speak of Eastern civilisation, what we really mean is nothing more than our own isolated regional culture.

DON'T MISS

OUR

NEXT ISSUE

Send in your Renewal Promptly

wise connected with any river, forest or hill.

The Post Card requires a Half Anna Stamp.

THE MANAGING EDITOR,

THE ALLAHABAD FARMER,

AGRICULTURAL INSTITUTE,

ALLAHABAD, U. P.

(INDIA).

DON'T MISS

OUR

NEXT ISSUE

Send in your Renewal Promptly

countries.

DEAR SIR,

I have been pleased to receive your complimentary copies of the *Allahabad Farmer.* Please register me as a regular yearly subscriber.

The first issue may be sent by V.-P. P.

Name.....

Address.....

.....

Signature.....

October, 1930.

ECONOMIC SURVEY OF MIRANPUR BASAHI VILLAGE, BENARES DISTRICT.*

B. S. Agarwala, Lecturer in Economics, Agra College, Agra.

Introductory.

Miranpur Basahi, a village in the neighbourhood of Benares city lying at a distance of about four miles from it, is divided into two blocks by a road passing north and south from Sindhora to Benares city. The village is attached to Benares tahsil for the purpose of collecting revenues, and forms a part of the Shiupur pargana with its police station at Orderly Bazar, near the courts. It is situated at a distance of about $2\frac{1}{2}$ miles to the north-west of the Benares Cantonment station on the E. I. Railway.

The village is an ordinary type of its kind and can hardly claim to lead the life of self-sufficiency of the by-gone days, although the disintegrating forces have not had their full play as yet. It is becoming dependent more and more for its life-blood upon the neighbouring city, where most of the male members, including boys of eight to ten, go to work in mills and factories.

Boundary.

The village is surrounded on all sides by the cultivated areas of the neighbouring villages. On its northern side is located the village Lalpur, on its eastern side Anaula and Takhtakpur, and on the southern and western sides lie the villages of Sarsauri, Narainpur, Lachimanpur and Nawalpur in order.

Soil.

The village is in no wise connected with any river, forest or hill. The soil of Basahi, as judged by its productiveness, is wonderfully fertile and presents little variety. The surface of the village is flat, and the soil is generally alluvial in character. Of the total cultivable area of 193.45 acres, 57·12 acres have domat or deep alluvial soil; 36·42 acres have tal-matti or soil in the neighbourhood of tanks fit for rice cultivation; and the soil of the remaining 89·91 acres is light and sandy in character, and certain spots are porous and dry.

The Thee Purvas.

Basahi village can be divided into three distinct groups. The village is not a compact whole having all the houses centred at one place, but its inhabitants are divided into three *purvas*.

*Indian Journal of Economics—Vol XI, Part I, Page 56.

The first division which lies on the western side of the road is known as Ahirtoli, the place where the Gwalas live. The second *purva* lying on the eastern side of the road is known as Kunbian, where Kurmis predominate. This division is very thickly populated, and the houses are built very close together. On the far eastern side of the road lies the Chamartoli, the third division, inhabited by the Chamars exclusively, who lead a dirty life.

Number of Houses.

The number of houses including straw huts and *chappars*, but excluding thatched *ataries* from where the farmers watch their fields and temporary huts in the fields, is about 107. Besides these there are one *serai* and two small park gardens bounded by earthen walls. Of these, 68 houses are occupied by the Kunbis, ten by the Gwalas, fourteen by the Chamars, and the remaining fifteen by the Kayasthas, Gadarias, Nonias, Brahmans, Khattriyas Lohars, Telis, Nais, etc., each sect having one to four houses for itself.

Their Description.

There is a remarkable contrast—between the representative houses of the Ahirs, Kurmis and Chamars of the village. The houses of the Ahirs are less decorated and simple in style; tiles, straw and bamboo are the chief material for roofing, and the walls are made of soft soil. Some houses of bricks have been recently built, and in front of them beautiful though crude figures have been painted. The houses of Kunbis are smaller than those of Ahirs suitable houses for pigmies to dwell in. These are very closely packed together. The Chamars being the depressed class of the Hindu society have poor and odd-looking huts to shelter them, and they seem to be contented with their lot. In all these houses the provision for ventilation is very defective, and they are so closely built that it is difficult to distinguish them from one another. Apparently there is no unsatisfied demand for housing, as many of the houses lie vacant, two Telis having recently left the village. There is some demand for housing accommodation in the Kunbian division, where the houses and huts are so thickly clustered together for want of space.

Distribution of Population.

The total population of the village, as estimated by actual enquiry, is about 629 persons—a figure slightly higher than the census figure of 1921. Of this total, 290 are Kunbis, 80 are

Chamars, 61 Ahirs and others 191. Their percentage is as under :—

	Population.	Percentage.
(1) Kunbis	290	46
(2) Chamars	80	13
(3) Ahirs	61	11
(4) Others	191	30
Total ..	622	100

Civil Conditions.

The civil conditions of the village are fairly normal. The village women do not observe *purdah*, and the custom of widow marriage is prevalent in the village, specially among the low-caste people. There are few people who are left unmarried for marriage is deemed to be a necessity in India. The number of widows is limited ; only those remain widows who lose their husbands at an old age. The percentage of married men and women is fairly high, the reason being that child marriage is not discouraged. The average age of marriage is a little over eleven years, but cases are not wanting where the Kurmis of the village marry their children even at the age of two to four years. The Brahmans and the Kshattriyas generally marry their girls when they have attained puberty. The question of large dowries among these people is positively harmful, and needs to be discouraged. The following figures are suggestive. They show the distribution of the village population according to sex and civil conditions.

Distribution according to sex and civil conditions.

	Male.	Female.	Total.
(1) Married	214	221	435
(2) Unmarried	121	73	194
Total ..	335	294	629

Agriculture (Area.)

Like all other villages of India, Basahi is an agricultural village. It comprises an area of 219 acres or nearly 315 bighas and 9 biswas. Of this total, 183 acres, or nearly 83 per cent. constitute cultivable area under different farmers. The remaining 17

per cent. is under common waste, and under *abadi* and *talabs*. Figures showing the distribution of land are as follows :—

How used.	Area	Percentage.	Remarks.
	Acres.		
(1) Under cultivation ..	183.45	83.45	About 20 acres were left as fallow land.
(2) Do. the *abadi* ..	13.37	6.0	
(3) Do. common waste ..	12.33	5.5	These are grazing grounds for cattle.
(4) Pastures other than common waste	Nil	..	
(5) Under the gardens ..	8.62	4.0	
(6) Wet-land area ..	1.89	1.0	This is under *talabs*.
(7) Dry-land area ..	Nil	..	Rains are sufficient and the Ganges is very near the place.
Total, Area ..	219.66	100	

A close scrutiny of the above figures gives us two most interesting facts—one about the occupation of the people, and the other about the density of population. Of the total village area of 220 acres, no less than 183½ acres are classified as area devoted to agriculture, of which nearly 20 acres lie fallow every year. This means that 163½ acres (or nearly ¾th of the village area), are under the plough. Agriculture is, therefore, the mainstay of the people, and nearly 50 per cent. of the people (315 out 629) are actually engaged in agricultural work.

Density of Population.

The uncultivated area comprises a small portion of land : it includes the *abadi* area, the common waste land and the pastures, the wet areas and the gardens. From the above table we find that nearly 13½ acres of land are reserved for habitation purposes. Within this space about 107 houses containing nearly 630 souls are built up, giving an average of eight houses to the acre, or nearly 47 persons to the acre. Each person has, therefore, on an average about 100 sq. yards of land to live upon revealing to us

the fact that there is no overcrowding in the village on the whole. It must however, be remembered that the Kunbian portion of the village is a bit thickly populated, showing a tendency for overcrowding in the future.

Other figures in the table need little comment. Some 13 acres are common waste land for the grazing of cattle, there being no pastures in the village. Also there is no dry area in the village, owing to the fact that there are ample rains ; and that the village is only five miles away from the Ganges river. The area under the gardens is about nine acres only.

Irrigation.

There are only eighteen wells in the whole village. Of these twelve are within the village *abadi*. These are used mostly for drinking, cooking and bathing purposes. The remaining six wells are either on the road side or in the fields and are used for irrigation. Besides these there are eight tanks in the village. The most important of these is the Bital Bhutt tank ; an artificially-made tank deriving its name from the present owner of the village. Other tanks are small and shallow, and get dried up in the summer. Hence these are unfit for irrigation purposes, except in the rainy season. The quantity of land irrigated with the help of these wells is about 114 acres ; the remaining 70 acres either do not need irrigation, or else they are left unirrigated. The wells of the neighbouring villages are also made use of by the people of this village for irrigating their fields.

Tenancy.

The village is held under permanent settlement, and the chief owner is Chhanu Jee Bhutt, a wealthy merchant of Benares city. He realises his revenues from his tenants and, in his turn, pays to the Government a fixed sum of money every year. Rents are mostly paid in cash, although sub-tenants sometimes pay in kind by giving half the produce raised by them. There are four classes of tenants in the village, and the total cultivable area of 18,336 acres is divided according to the tenancy rights as follows :—

	Acress.	Per cent.
Sir land	1.59	1
Occupancy tenants	73.93	41
Shikmi tenants	72.30	40
Fixed-rate tenants	27.94	15
Sub-tenants	7.55	4
Total ..	183.36	100

Size of a Field.

The total area under cultivation is divided into 530 fields. The area of the largest field is 7·33 acres, and that of the smallest field 1·100 acre, the average size being 3·66 acres. Jai Mangal Singh is the biggest landowner in the village, who cultivates about 16 acres of land. The fragmentation of holdings is a very prominent aspect of agriculture in this village. No less than 426 out of 530 fields are under one bigha in area. Thus over 80 per cent. of the fields are only small patches of land. The distribution of fields according to the size of a holding is as follows :—

	Fields.
Under 1 bigha ..	426
Over 1 bigha but under 2 bighas ..	92
„ 2 „ „ „ 4 „ ..	9
„ 4 „ „ „ 6 „ ..	1
„ 6 „ „ „ 8 „ ..	1
„ 8 „ „ „ 10 „ ..	nil
„ 10 „ „ „ .. „ ..	1
Total ..	530

Fragmentation of Holdings.

The above figures disclose a serious state of things. This extreme sub-division of holdings which is certainly deplorable, is chiefly due to the laws of inheritance of the country. The Agra Tenancy Act of 1926 has made some provision to effect exchanges of the plots of land so as to consolidate them into bigger plots to avoid unnecessary waste of time and money, but on enquiry it was found that the cultivators are not anxious to effect such exchanges. This evil of fragmentation gets still more intensified by the scatteredness of the holdings of a farmer all over the village, instead of their being concentrated in one spot. This evil deserves serious attention of every social reformer. Co-operation would be of immense help in solving this problem.

Need for Co-operation.

The example of Tharpur village in the Punjab is a living tribute to co-operation, and shows what co-operation has done in effecting the consolidation of holdings. Not only the number or the fields have been reduced from 844 plots, to 63 plots but their average area per plot has been raised from 4 kanals to 55 kanals.

Area Under Crops.

The Kurmis of the village raise mostly 'cereals'—rice, wheat, barley, maize and millets—the area under crops being 138 acres on an average per year. Pulses are grown as mixed crops. Garden crops, including sugarcane, potatoes chillies, etc., and fruit cover nearly 30 acres of the area. Nearly 20 acres are devoted to the production of fibre plants. Other crops are of minor importance. The statistical details about the crops are as under:—

	Acres.
Rice	39.22
Wheat	9.74
Barley	60.80
Wheat and barley	5.48
Gram and maize	22.73
Arhar and juar	21.11
Vegetables and fruits	20.68
Fibre plants	20.20
Sugarcane	13.84
Mixed crops	6.28
Other minor crops	6.19
Total, Area sown ..	226.20

It will be noticed from the above details that barley and rice are the two most important staple crops of the village, and wheat is grown as a subsidiary crop only. The total area actually sown is 220 acres, but the above figures are slightly in excess owing to the fact that certain crops are sown side by side in the same field. We have already seen that the total cultivable area is 183 minus 20 acres, that is, 163 acres only. Most of this area is sown twice in the year. Only a minor portion of land is devoted to the production of one crop in the whole year, and some to the production of even three crops in the year, as will be evident from the following table :—

One crop in one year raised on	19.7	acres or	9	per cent	nearly.
Two crops „ „ „	186.26	„	84.5	„	„
Three „ „ „ „	13.84	„	6.5	„	„

Insect Pests and Plant Diseases.

The crops raised in the village are subject to the danger of insect pests and certain plant diseases. There are certain pests that injure all crops alike, e.g., the white-ants. These begin their work as soon as the crops are sown. Sugarcane is the chief victim of white-ants. To combat this evil the villagers either smear the pieces of sugarcane with the solution of *asafoetida*, the smell of which keeps the white-ants away; or they spread cowdung on the edges of the field to keep the white-ants away from the sugarcanes; or they sprinkle ashes of burnt wood to render their teeth useless in eating. Then there are pests that effect particular plants. Thus the small and green pests known as Jhansi attack the vegetables in swarms and eat up the leaves. Ashes of burnt wood when sprinkled on the leaves disable these germs from eating away the leaves. Again there is a moth known as Chiduli that bores a hole in the stalks of plants, and goes on eating until the leaves of the tree begin to grow pale. The farmer tears the plant and throws the moth away. Rice is attacked by Karra which resembles a fly. It eats the leaves of the plants. The farmers do not know any remedy for this pest, except to drive it away again and again. The enemy of *sarson* (oil-seed) is Maho, a small green insect hardly visible to the eye. They cling to the plants from top to bottom and render them absolutely useless.

Plant Diseases.

Beside these insect pests there are several plant diseases. Wheat suffers from Girui which makes the plant pale and useless. Alsi suffers from Harda in much the same way as wheat. Kandaua affects barley turning the ears of barley black, so that when pressed with fingers, they get reduced to black powder. Millets suffer from Banjha on account of which there comes out a knot of folded leaves instead of an ear on the top of the millets. Gram suffers from Ukhta, which turns the plants dry altogether. It is deplorable that no regular methods to combat these ills are known to the villagers. They think that these diseases are caused by some defects of the atmosphere and of the land. It is extremely necessary to devise some means to fight these pests and diseases.

Implements and Manures.

The people of the village, being conservative in their habits are even today given to their old practices. Improved methods of cultivation are either unknown to them, or else they are not able to make use of them owing to poverty. The cost of production

has increased considerably in modern days, and even the most efficient farmer has to face real difficulties in producing and marketing his crops successfully. In most cases farmers have to lead a hand to mouth life. Generally speaking, the old types of ploughs and instruments are still used in the village although some farmers have begun to use better types of ploughs that leave a deeper and wider furrow.

Manures.

What is true of implements is equally true of manures. The traditional manures are used even today. All the filth and dirt of the village is deposited at one place and is left to decompose. This waste matter, and the dried and decomposed leaves of the trees, are the chief sources of manure in addition to the cattle-dung and urine. It is indeed unfortunate that nearly 50 per cent. of the dung is utilized as fuel instead of being used as manures. The modern fertilisers and manures are not known to the villagers, and even those who know their value find them to be very costly.

Livestock.

The livestock of the village is largely possessed by the Kurmis and Ahirs of the village. There are about 100 oxen, and bullocks, two-thirds of which belong to the Kurmis. The number of cows and calves is 45 and 61, respectively. There are 160 sheep, 24 goats, 50 rams and 2 horses. The details are given below :—

	Ahirtoli.	Kunbian.	Total.
Oxen	17	61	78
Buffaloes	18	3	21
Cows	22	23	45
Calves (of cows and buffs)	23	38	61
Goats	24	Nil	24
Sheep	160	Nil	160
Rams	48	2	50
Horses	Nil	2	2
	Total	..	441

Poor Feeding.

The livestock of the village is poor both in quality and in number. Animals are not capable of doing strenuous work. They are ill-fed and ill-cared-for. The arrangements for supplying fodder for cattle are wholly inadequate. Their ordinary diet is a mixture of *khali* and *bhusa* in water, but only the rich are able to provide these in sufficient quantities. There are no regular grazing grounds or pastures kept for the purpose of feeding cattle.

Cattle Diseases.

The cattle of the village are subject to certain peculiar diseases, the most common of these being the Chabha, which produces swelled lumps in the necks of cattle. Lime is used to cure it. Sometimes swelling in the stomach also appears, which is treated with the solution of a newly-grown bamboo plant. Wounds also appear under the yoke ; to cure these kerosene oil and phenyle are made use of.

Occupation, Trade and Transport.

Occupations.

As already stated, the main occupation of the village people is agriculture. Of the 629 persons, no less than 315 or nearly 50 per cent. are engaged in agricultural pursuits. The rest of the persons are either children or dependents, or pursue some other calling. People also combine certain other subsidiary forms of occupations with agriculture. A certain number of persons are engaged in petty posts such as the qanungo, the patwari, the teacher, and cooks and bearers. The gadarias, the potters, the blacksmiths and the barbers carry on their usual trades as of yore. In Ahirtoli the *gwalas* carry on the work of supplying milk in the city, in addition to their agricultural operations on a small scale. Most of the young men of this part have now taken to painting lorries, motor cars, carriages, etc., for want of any other suitable occupation. The industrious Kurmis still carry on their agricultural pursuits to a large extent, although a few of them have recently taken to the painting business. There are also one or two petty shop-keepers in the village who supply mostly tobacco, salt, cheap grains, etc. Some of the village people have opened shops in the Orderly Bazar near the Benares Kutchery. In Chamartoli some 12 families of the Chamars, one of a potter, and two of basket-makers live. The potter makes earthen pots, and the basket-makers prepare baskets for

village people. But the Chamars of the village now mostly serve as cooks and bearers to the European officials in the Cantonment and their wives work as ayahs to the European children.

Industry and Trade.

On the whole the people of the village are industrious. The Kurmis are diligent, honest and hardworking, but the Ahirs possess dirty habits and are great cheats. The industry and trade of the village is on a very limited scale, and hardly needs any mention. The old village industry of hand-spinning and weaving is not at all practised in the village. Other industries such as those of the potter, the carpenter, the basket-maker, and the blacksmith, etc., are carried on only to meet the needs of the village people. Since the industries of the village are in a state of backwardness, the means of transport are naturally undeveloped and old fashioned, although there is one pucca road connecting the village with the city and the railway stations. Most of the daily needs of the village people are supplied by the neighbouring village of Bhojubir lying at a distance of about half a mile from the village under investigation. It is, therefore, well connected with markets; although the means of transport are wholly inadequate and primitive by nature.

Handloom Spinning and Weaving.

The Charkha movement of Mahatma Gandhi did awake the villagers to the need of starting and developing the spinning and weaving industry as far as possible, and the majority of the people at once took to the occupation in 1922, but with the downfall of the movement the industry was altogther given up. There are no weavers in the village to continue the industry. Moreover, the Moti Cotton Mills, which lie close to the village, besides supplying plenty of work to the labourers, supplies them with quite cheap and decent cloth for their daily needs. Hence there is no scope for this indigenous industry to thrive so far as this village is concerned. Again, the soil of the village is not suited for growing cotton, which is the chief raw material to work upon. This is an additional reason for the neglect of the industry in the village.

Need for Co-operation.

To maintain our cottage industries in an efficient manner the spread of co-operation is absolutely necessary. It is, however, deplorable to note that few people, if any realise the benefits of co-operation in developing our home industries. If the various trades and industries be started on a co-operative basis, there can be hardly any doubt for their success in the future. By this

means the people will learn the lessons of self-help, honesty, fellow-feeling and thrift. In the long run they will be able to earn larger incomes, and thus raise their standard of living by and by. The failure of the movement in the United Provinces is largely responsible for turning away the minds of the village people from its adoption. The true spirit and principles of co-operation have not been rightly understood by the people, and the lack of character of the members is one of the chief causes of failure of the movement. The illiteracy and ignorance of the people gave occasion to the dishonest secretaries and supervisors to mislead and deceive them. These facts account for the failure of the movement, and the loss of faith in the societies.

Trade and Transport.

The trade of the village consists primarily in the scale of foodstuffs, and chaff produced in the village itself. Sometimes the whole crop is sold at the village field, but mostly it is taken to the markets in the neighbourhood for sale. The village people being generally illiterate and ignorant have not the tact of a business-man, and hence fail to get as much as they ought to. Generally they carry their crops to the market in bullock carts, on pack-animals, or on their heads, as may be convenient for them. The trade and transport of the village has been carried on in the old style for centuries with a few minor changes here and there. The trade in milk, ghee, dungcakes, wood-fuel, earthen pots and wooden goods is carried on a prettly large scale in the village, and the proceeds from the sale of these things are in some cases quite sufficient to meet the needs of the village requirements at the present day in India.

Co-operative Maketing.

The methods of co-operative marketing, and of purchase and sale would be of great help in securing fair prices for the cultivators, and in providing them with cheap raw materials and instruments. Moreover, the profits of the middle man would be eliminated altogether, and the farmers would be the gainers to that extent. Also many other wastes incidental production and sale would be avoided to the advantage of the village people.

Labour, Wages and Indebtedness.

Labour and Wages.

The labourers of the village are mostly engaged in ploughing, sowing, irrigating and other similar operations connected with agriculture. The wages are paid partly in kind and partly in money. There are some labourers who keep their ploughs and bullocks to let them on hire system to the zamindars and big *kashtkars* who do not own them, and are paid at the rate of Rs 2, both for his labour and for the hire of the plough and the bullocks for a day's work. Some of the villagers keep their own ploughs and bullocks, and hire workers to handle them, and also to do other agricultural works in the fields. The labourers are paid in money, and receive a small quantity of *chabena* every day. Some labourers are paid monthly, fortnightly or weekly, with some quantity of grains as agreed upon. One striking feature of the village is that women are employed to work on the sugarcane fields whereas this work is done by men in other places. These women generally earn two annas per day, and a small quantity of *chabena* in addition to the money wages. The general rate of wages in the village is eight annas a day for adult labourers. Some *chabena* and *gur* is also granted for their daily breakfast.

Savings.

The income of the labourers is not so great as to enable them to make any savings, nor are they frugal by habit. Thrift is something foreign to their minds, and they lead a life of abject poverty. There are, however, some families that save whatever they possibly can. Bansh Narain, Ram Newaj Daftary, Tulsiram, Ramdass and a few others are able to save something. Much of their saving is in the form of ornaments for their family; and the little amount of money saved by them is kept buried underground, as there are no banks in the village to encourage savings in the form of deposits.

Indebtedness.

Most of the village people are under heavy debts, which they are not able to pay off. The farmers need tools and seed and bullocks for their agricultural work. For this they are obliged to borrow money at high rates of interest. Then they have got ceremonial and domestic expenses. Some money is needed for these too. As there are no *mahajans* in the village, people borrow money from the city *sahukars* Babu Rághubir Singh of Ishwarganj,

and Munnilal Kalwar and Dwarika Nonia of Pandepur. A debtor borrowing Rs. 14-4-0 has to pay Rs. 20, in twenty instalments of one rupee each, *hundi* system is also in vogue. The rate of interests is 20 per cent. to 24 per cent. per annum, compound interest. Farms of the fixed-rate tenants are sold on *rahan*, the rate being Rs. 100 to Rs. 150 per bigha according to the fertility and the Government revenue of the land. According to the *rahan* system a debtor pays 10 per cent. to 12 per cent. per annum compound interest. Only one debtor, Raghunandan Kurmi, has liberated himself from indebtedness through his ability and hard work. The illiterate villagers are quite ignorant of the usefulness of the Co-operative Credit Movement in solving the problem of indebtedness. There is no common fund, permanent or temporary, for any common good whatsover. Even the *takavi* loans are not availed of by the village people to meet the seasonal expenses in connection with their agricultural work.

Sanitation, Education and Administration.

Sanitation.

As already stated, the houses of the village people are old-fashioned, low and ill-ventilated. People are very dirty by habit, and collect heaps of dirt and waste matter here and there without discrimination. The drainage system is entirely defective, favouring the multiplication of insects like mosquitoes which are the chief source of malarial fever. The paths in between the houses are very narrow, hardly allowing one man at a time to pass through them. These paths are mostly used by the villagers as urinals, at great disadvantage to their health. The atmosphere outside their houses is rendered foul by the heaps of refuse and cowdung that are left to decompose to be used as manure for their fields. It is highly desirable to deposit this waste matter in pits away from the dwellings, preferably in their own fields or near them.

Wells and Tanks.

Wells are indiscriminately used both for bathing and drinking purposes. They generally take their bath by the side of the wells, spill much water, which owing to defective drainage system, is left to stagnate, and serves as a breeding-place for mosquitoes and other insects. People also go to take their bath in the Basai tank where *dhobies* also come to wash clothes. This practice needs to be discouraged.

Epidemics and Diseases.

The village has not been visited by any epidemics like plague or cholera for the past three or four years, although seasonal diseases, like malaria, do make their appearance. The great enemy of humanity—tuberculosis—is fast making its home in the villages, to check the spread of which sanitary measures are absolutely necessary. It is sad to note there are no doctors or hakims near the village to give medical help when needed. People generally go to the hakim at the Orderly Bazar in cases of ordinary illness, but in serious cases they go to the Government hospitals in the Benares City.

Generally women do not observe *purdah*, but some *purdah* high-caste people have it in their families. This produces a bad effect on the health of the ladies by checking their activities. Early marriage too has got a detrimental effect upon the health of the married couple. Both these practices need discouragement, as children born of such parents are bound to be weak and puny.

Education.

The people of the village are not well-educated. Only four or five per cent. of the people know how to write their names and there are only three persons who know some thing of the English language. There is a great want of education in the village, but the people are quite indifferent towards it. It is said that there was once a primary school in this village, but now it is no longer in existance. However, at about a distance of a mile from the village, there is a primary school at Bhojubir, where the children of the village go to read and write. They are mostly given education in Hindi and Urdu vernaculars. One boy of the village attends the Vernacular Middle School at Shiupur, about two miles from his home. Two other boys read at the London Mission High School, one of whom has appeared at the High School Examination. The average period of school life of the village children is low, and may be roughly estimated at about five years.

The following table gives the details about education in the village :—

Name of the School.	No. of students.	Caste.	Class.
Bhojubir Primary School ..	2	Ahir	Darja A. and B.
Ditto. Ditto. ..	2	Kaystha	Do. A. and B.
Ditto. Ditto. ..	1	Kurmi	Do. A.
Shiupur Middle School ..	1	Kaystha	Do. 5th.
London Mission High School.	2	,,	One sat at High School Examination.

The others have received English education. One has passed S. L. C. and is now a clerk in the Queen's College, Benares; one is the village patwari, and the third is employed by a contractor of the Benares district board. People are generally poor, and cannot afford to pay the fees. Female education is quite unknown in the village. Some efforts are necessary to improve the condition of the villagers by imparting education of an elementary character to suit their needs. *Lack of education is the chief cause of their backwardness.* It would be desirable to introduce compulsory elementary education for the village children, and to open night schools for the grown-up.

Administration.

The history of the village is a very obscure one. Only this much is known that it was founded by a Milki Mohammedan, and is now under the permanent settlement. This administration of the village is carried on the *panchayat* system. "Village Unions" are in existence, each having five or six villages under its control. The *panchayat* system has been introduced only recently, and there was no such system in existence till November, 1925. This system has, unfortunately, not worked quite satisfactorily till the date of the enquiry. Not a single case was decided by it till then, although the *panches* and the *sur-panches* had been duly elected by the Government, with the help of the village people. There is one *sur-panch* and six ordinary *panches* in every union.

The Mukhia.

Before the establishment of these unions, cases were decided mostly by the *mukhia* of the village, who acted as the judge in consultation with four or five other respectable persons of the village. This *mukhia* was not nominated by the Government, but was selected by the village people themselves. Thank God, there is not much of litigation in this village, owing to the peaceful nature of the inhabitants.

Conclusion.

In conclusion it may be stated that the village people are, on the whole, quite happy, but they would be happier still if the following improvements were gradually introduced in the village for their benefit:—

1. The introduction of elementary education.

2. The teaching of the lessons of thrift and self-help and the spread of the true co-operative spirit.
3. Improvement in the sanitation of the village.
4. Improvement in the methods of cultivation, and the introduction of supplementary industries.

All these improvements could be made only if people were to understand rightly the principles of co-operation, and bring them into use to ameliorate their condition economically, morally and socially.

THE RIDDLE.

Once upon a time death took by the arm a great Eastern ruler. Now the dead man bequeathed all his wealth to his son.

This youth, who had seen but sixteen summers, hastened to taste of those richer pleasures which a wise parent had denied him. Possessed of extreme beauty and much intelligence, he found that all the fruit upon the tree of his desire was his but for the plucking.

Only one dread came to disturb the soft, licentious laziness of his existence. This was the fear that perhaps his life would end while it was still young.

So great was this obsession, that he bade his steward send out into the world to discover the four wisest among men.

"And I shall demand of them," he said, "What I must do to live until I wish to die. And for him that gives the wisest answer there shall be a great reward."

On the appointed day, these wise men came before the Prince.

No sooner had he told them his perplexity than the sages, at once and altogether, commenced to offer their opinions, so that the air was shrill with learning.

The Prince calling upon them to cease, ordered that each should answer in his turn, according to his age.

"Sire," said he whose beard reached almost to his feet, "I have lived, a hermit, all my days alone with thought. If you would reach an age as great as mine, then let your life be holy in the eyes of God and He will grant you your desire."

The Prince turned to the second.

"And you?" he asked.

"Why," said the wise man, "this fellow is but a simple fool. For it is clear to all that to live long one must live sinfully, as the Lord, having then no longing for his company, will be in no hurry to summon him away."

Now up leapt the third.

"Sire," he cried, "they are brainless idiots both. Only by knowledge can you ensure longevity. Devote your days to learning and to books, and death will stay his hand out of respect for such a reservoir of wisdom."

"Piffle," cut in the fourth, "If it is proof your Majesty desires, then here it is. A dead donkey is a sight unknown. So spare your brain from work of any kind, and be content to eat and sleep and do those things that gratify your senses; then, donkey-like you never need fear death."

Now the young Prince, greatly perplexed and distracted, slipped away to walk upon the sunlit terrace where he might think in peace. So absorbed was he that, descending the great marble steps, he failed to notice the skin of a banana, tossed there by a certain lovely baggage from her window up above; and stepping upon it he slipped and fell and broke his neck.

WHY I CAME TO THE AGRICULTURAL INSTITUTE, ALLAHABAD.

By Nirmalkanti Sen.

From my very early boyhood I had a mind and an interest to learn agriculture. When I was a school-student, I was wont to think and believed that every man in this world, however insignificant he might be, has something to do. He is a part and parcel of the world, rather of the universe, and if he does not add something memorable to the store of the universe, then though its collection of memorable works may be a very magnificient, precious and holy one; still it will never be a complete one. I also believed that each and every person can shine at least in one profession or other of life. God has bestowed upon him necessary power, if not sufficent, by which he can play his part well in the theatre of life. It seems to me that if a man does not succeed in his life career, it is because he does not exercise fully the gifts and powers which the Almighty has conferred upon him. I was influenced by these ideas and thoughts. By and by a problem arose in my mind, "What sort of education should I pursue, so that I may not pass my life in vain"? From that time onward I began to think seriously about it in order to solve the problem. I thought about it for several months and at last came to the conclusion that I must study Agriculture. This was my early conception.

As days went by I came to know the pecuniary conditions of the farmers of our land—their sorrows and sufferings – the importance of agriculture—its condition and the scope for improvement. The census of 1921 reads that out of a total of 247 millions of people in British India, 178 millions are agriculturists, i.e.,

72 per cent. of the people are directly employed in agriculture. Sir John Strachey says, "It is probable that 90 per cent. of the whole population in India are so closely connected with the land that they may properly be called Agricultural." Then again, agricultural production is the basis of many of the important Indian manufactures, *i.e.*, the development of most of the Indian manufactures are co-related with the improvement of Indian agriculture. The purchasing capacity of Indians depends on agricultural production. If they can produce and sell the maximum amount of goods with the minimum amount of labour and capital, then they may be able to purchase more goods manufactured in India by Indians and thereby can help Indian manufacture. The foot-hold of Indian export and import trade also rests upon Indian agriculture. Imports depend upon our capacity to export and the purchasing capacity of the Indian agriculturists. So we see that during famine it is not only the export trade which suffers but also the import trade. The financial condition of the Government of India depends upon India's agricultural prosperity. In a year of famine, due to inadequate monsoons, the Government finances are considerably reduced due to expenditure on famine relief and a fall in the Government revenue. The said reasons clearly point out that agriculture is at present the most important single industry in India and will remain so for many years to come. The prevailing agricultural condition of India is very poor and it may be said that nothing has been done in this sphere, when it is considered what could be done by the help of modern science and machinery. It is also true that so long as the educated and intelligent people of India will not put their sons into the agricultural profession, their fate will be darkness, sorrows, and sufferings caused by under-feeding and famines.

The other reasons as to why I wanted to get an agricultural education are as follows:—

(1) For the sake of acquiring knowledge ;

(2) To start an agricultural farm and to manage it profitably;

(3) To teach the farmers of our locality better and modern agricultural farming ;

(4) To write and publish agricultural books, bulletins and magazines, if possible;

(5) To earn my livelihood ; and

(6) To put emphasis on starting agricultural experimental farms along modern lines as a solution of the present problem of unemployment, especially of the so-called educated young men of India.

There is no agricultural college in Bengal, Assam, and Bihar and Orissa, except the Imperial Institute of Agricultral Research at Pusa where post-graduate students, only, may carry on with their study. For me and many other students of those provinces there does not exist ample or necessary facilities for learning agriculture in these provinces. However, I came to know the names of eight agricultural colleges in India through the "Royal Commission on Agriculture in India." The names of those colleges is given below with the reason or reasons as to why I did not try to get admission to them except one:—

1. Agricultural College, Cawnpore:—In the rules for admission of students, not domiciled in the United Provinces to the College, I found:—

(*i*) Students are admitted only on the recommendation or at the request of the local Government or Political Agent concerned.

(*iv*) In addition a fee of Rs. 1,500 per annum will be charged per student to the local Government or the Indian State concerned.

(*v*) No student not domiciled in the United Provinces will be admitted to the exclusion of qualified United Provinces students."

2. *Agricultural College, Coimbatore.*—Students are required to pass the Intermediate Examination in Arts or Science. As I had passed only the Matriculation Examination I did not attempt to join the college.

3. *College of Agriculture, Poona.*—Students not domiciled in the Bombay Presidency are required to pass the Intermediate Examination in order to get admission to the college.

4. *Agricultural College, Nagpur.*—I did not apply to this college for admission, because the expenses of the students not domiciled in the Central Provinces are rather heavy and preference is given to the students of the province at the time of admission.

5. *Agricultural College, Lyallpur.*—I wrote to the Principal to send me a copy of the prospectus of the college. He replied that the prospectus can only be had on producing seven annas as its price. Accordingly I sent him the money; but, to my wonder, he simply returned the money.

6. *Khalsa College, Amritsar.*—I did not apply for admission to the college due to it being situated at a considerable distance from our province, Bengal, as well as others also.

7. *Agricultural College, Mandalay.*—The qualifications for admission to the college are partly given below :—

"(*ii*) A good knowledge of the Burmese language, both spoken and written, is essential.

(*iii*) Candidates must have been born in or domiciled in Burma."

I do not know a bit of the Burmese language nor was I born in or domiciled in Burma.

8. *Agricultural Institute, Allahabad.*—I tried to get admission to the college due to the following main reasons :—

(*a*) I was qualified, according to the prospectus of the college, for admission and students of no province are given preference.

(*b*) The expenses of the students at the college are rather moderate.

(*c*) There is an opportunity for the students of the college for self-help. They may earn a part of their expenses by working at the college.

A NOTE ON THE ERADICATION OF KANS GRASS.

By M. Vaugh, B. Sc. Ag., A. E.

The subject of eradication of *kans* grass is one that has received much attention in India on the part of Agricultural workers. It has been generally recognised that the country method of digging up the root and separating it from the soil by hand involves a larger expense than the value of the reclaimed land will usually justify. Attempts at eradication of *kans* by the use of steam cable plowing outfits or tractor outfits have usually taken the form of attempts at deep plowing. Experiments on such plowing have usually assumed the necessity of plowing to a depth of 8 inches and have usually recommended plowing up to ten or twelve inches to ensure anything like complete eradication. These attempts have usually been made in the dry weather and have been generally successful in so far as the removal of the grass was concerned. They have, however, usually involved the expenditure of large sums on equipment often exceeding rupees one lakh and this extremely high expenditure has limited the application of this method. So far as I am aware the only serious attempt of which the results are published by other methods than deep plowing has been that of Mr. Howard of the Indore Experiment Station.

Mr. Howard's method involves the cutting of the roots at a depth of about 8 inches by the use of special adaptation of a common type of ridging plow. This is worked by bullocks and is reported

by Mr. Howard and others to have given satisfactory results in so far that the *kans* has been removed with reasonable effectiveness. So far as I know up to now all of the efforts made have involved the use of special machinery usually costing a comparatively high price when the work accomplished is considered and in general the equipment so required has not been useful for other kinds of work after the eradication of the *kans* is completed. Large cable plowing outfits have not been generally adapted to agricultural conditions in India and so far as I know the specially adapted implements used by Mr. Howard are utilized for no other purpose. If the cultivator, either a large zamindar or a small cultivator, could be assured that the same equipment could be effectively used for cultivation after the removal of the *kans* I think the chances of inducing him to purchase the equipment would be considerably improved. The use of the large steam tackles necessarily pre-supposes very large areas, on the other hand, the use of the small bullock outfits proposed by Mr. Howard limits their use to comparatively small areas. So far as I know no extensive effort has been made to secure a medium size outfit which could be worked by an ordinary 15—30 size tractor and the equipment for which could if possible be used for cultivation of the reclaimed plots afterwards. I therefore suggest that a series of experiments be organized on the following lines and for this specific purpose. The purpose of the experiment to be first a comparative test of the economics of eradication for deep plowings, by the use of an implement patterned on Mr. Howard's recommendation, and ordinary implements adapted for use in cultivation after the reclamation of the land is complete and secondly a testing of various types of ordinary implements and methods of their application to determine which is the more effective implement and what is the most effective and efficient method of employing it. I suggest that the source of power employed should be a tractor of approximately the size know as 15—30 horse-power of some standard make well known and on sale in India. For the implements to be used with it I will suggest that the following implement be selected.

For the deep plowing trials a plow of the type known as a brush breaker or grub breaker should be tried. Along with it an ordinary type of two-bottomed mould board plow might be tried. though I doubt the ordinary type plow being sufficiently strong to stand under the strain of such heavy work. I consider that the test of the brush breaker type for deep plowing will be mainly for the purpose of economic comparison of costs. Undoubtedly this type of plow will break up the soil to the required depth and will in all probability effectively eradicate the *kans*. The use of it, however, will be slow and expensive and I seriously question

whether it will be adapted to ordinary agricultural uses after reclamation of the land is complete. So far as I am aware the method proposed by Mr. Howard has not as yet been adapted to use with tractors. The bullock power type of implement used by him is neither large enough to economically utilize the power of the tractor nor is it strong enough to stand the strain which would be impossed on it by the tractor. It would, therefore, be necessary to develop an entirely new implement suiting the purpose. I will suggest that experiments in this direction might profitably be started by utilizing parts of the standard listers used in America in the dry semi-arid regions of the west. These lister bottoms are similar to ridging plow bottoms used as a basis of Mr. Howard's recommendation. They would have to be mounted in a suitable manner several of them together and possibly suitably stiffened. This work might be carried out by manufacturers in America, by the dealers in India or in the workshop of the Agricultural Engineer to Government, Cawnpore, or possibly in the workshop of the Agricultural Engineer, Allahabad Agricultural Institute. They would need be carried out under the supervision of some one experienced in such work and where suitable facilities are available. This again is likely to result in an implement which is suitable for this one purpose, but not for general cultivation, though it is possible that it may be used in other ways for shallower cultivation at some reduction in efficiency.

Certain work carried out at the Agricultural Institute has led me to believe that there is a possibility of accomplishing the reclamation of such land by other methods and with tools that are commonly used in ordinary cultivation work. In order to do this it will be necessary to carry out the reclamation procedure at the most suitable season of the year rather than as a hot weather operation. Observation of several fields infested with *kans* leads me to believe that propagation is at least as much from seed as from underground roots. It is also a well-known fact that any plant deprived of its leaf surface will sooner or later die. It seems likely that a procedure can be worked out by which the plant can be repeatedly cut back in such a way as to eventually kill it. Experiments have been carried out at the Agricultural Institute with the disc harrow and with the harrow plow, but these are not quite conducive because the land had been worked to some extent before the experiments were started. It seems probable that if the land is thoroughly plowed and cross-plowed with a harrow plow just at the beginning of the rains when the soil has been somewhat soft, but not completely soaked all plants can be cut off below the surface of the ground and that a monsoon crop can be immediately planted. This work should be done partly with a skimming plow and partly with a disc harrow

to determine which gives better results and will do the work more cheaply.

It should be recognized that one operation will not complete the job of reclamation. It will be necessary to again cover the field thoroughly at the end of the rainy season or shortly after the *kharif* crop is harvested. However, a crop of some value may be secured during the first season, which may largely pay for the cost of the work done during that season. The land should again be gone over thoroughly at the end of the rainy season and again before the rains are well-advanced during the next season. If the grass makes considerable growth betwen the *kharif* harvest and the beginning of the following rains it may be desirabe to give one more working if there is sufficient moisture in the soil. It would be desirable to plant some *rabi* crop such as gram or barley. The same procedure should be followed the next year; that is, thorough working to cut off all leaf surface just at the beginning of the rains and again at the end of the rains. It will probably require two years or possibly three years to complete or approximately complete the eradication. Experience leads me to believe, however, that no serious difficulty will be caused by the grass after the first season and it seems probable that cultivation can be carried on regularly hereafter. The tools that are used for the reclamation work can continue to be used for cultivation afterwards. The cost per year will not be large as the ground is covered rapidly and effectively. Probably in most cases one or at most two plowing with the skimming plow will suffice for any one operation. This will cost from Rs. 3 to Rs. 3-8-0 per acre per operation.

THE EUROPEAN HONEY BEE IN INDIA.

By J. S. Baldry.

After five years practical research work, the European honey bee (*Apis Mellifica*) has been successfully acclimatized, and established in India.

India being one of the few countries where beekeeping on modern lines has not been developed, I came out solely to experiment both with Indian and European bees.

After may trials with Indian bees (*Apis Indica* and *Apis Darsata*) I have not found them a practical proposition, owing to their migratory habits, and poor honey gathering qualities.

Many tests have been made, and attempts to hybridize Indian and European bees have not been successful. This has also been the experience of beekeepers, in Japan and China, to which countries *Apis Indica* is also indigenous. Modern beekeepers in

all parts of the world, farming bees extensively for commercial purposes, use the European bee.

Much study and patience has been necessary in accomplishing results up to the present time. Owing to the long journey overseas, special methods of packing, and travelling had to be investigated, so that bees arrive at their destination in best possible condition, this could only be done after trial consignments had been sent, and observations taken at this end, as to the probable causes of failures, thereby errors being eliminated. A system of packing has been evolved, by which bees travel exceptionally long distances and arrive in excellent condition.

My bees have now been in India over 20 months and are now passing through the annual life cycle of bee activities, for the second time in this country, and should be well-acclimatized, for they are now in a healthy and prosperous condition.

A most important factor, that is, the rearing of "European Queen Bees" has been successfully accomplished in India, and are now mothers to the strongest colonies in my apiary.

All honey gathered has been of fine quality equal to any imported honey, I have sampled in India; which means that it will compete on the market with other fine honies, from any part of the world.

Although the average yield of colonies of bees last year was 30 lbs. of honey per colony, this is by no means a test of the real possibilities in India (I took 60 lbs. of honey from one colony).

It is probable, that there are locations more suitable to beekeeping, than where my experiments have been carried out.

The great variety of conditions in India, both climatic and topographical, make a tremendous field for further research work, in connection with beekeeping.

Irrigation of large areas of country now being developed is again a very important factor, in the possiblities of beekeeping.

My experiments have been carried out at Nasrapur, Poona district. Altitude about 2,000 ft. Annual rainfall 60 inches, Temperature Fall. Max. 100°. Min. 36°.

I should say a fair average agricultural district, would describe this locality. As a spare time industry to the farmer, beekeeping is considered a most profitable occupation, requiring less time and attention than other agricultural work, in comparison to benefit gained.

Before progress could be made with beekeeping, some means of teaching the ryot would have to be instituted, either through agricultural or other educational institutes, as some knowledge is necessary, for the management and behaviour of the honey bee.

Eventually beekeeping may be carried out as a whole-time commercial industry, as carried out in other countries; and some idea of possibilities may be given, from authentic reports and statistics.

			Value.
			£
U. S. A. produces	90,000	tons of honey, per annum	2,000,000
Canada „	10,541	„ „ „ „ „	580,000
New Zealand exports	1,253	„ „ „ „ „	75,000

Taking countries in similar climate to parts of India, Jamaica exports 5,000 tons of honey annually, while other islands of the West Indies, produce proportionate quantities.

The Hawaiian or Sandwich Islands produce large quantities. The Sandwich Honey Company alone, own 10,000 colonies of bees on these islands. To use the words of the manager of this company (Mr. Oswald Gilbert). "For the first seven years we were the joke of Honolulu, that there was money in honey production was beyond the dreams of the average islander." Not so now, for one of the richest bankers of Honolulu owns a chain of apiaries on these islands.

European bees are used in all cases.

It is desirable to mention why the European bee is necessary to make a success of beekeeping. Owing to the long, and severely cold winters of Europe, the honey bee has the instinct to hoard up a great amount of honey, as food, to support them during the time when flowers are not available, in doing so much more is gathered than is actually needed, and therefore the beekeeper is able to take the surplus for his own use and profit. The Indian and other bees of tropical countries, have not the instinct to store surplus honey, to anything like the same extent, for having for ages past, been able to live from hand to mouth (so to speak) and this coupled with the migratory habit, has not cultivated the instinct to store up large quantities of honey.

It is hoped these European bees now established in India, will prove to be the nucleus, of an important and profitable industry to the people of India, and that ways and means will be found to teach people to become skilled apiarists, for undoubtably, thousands of tons of honey go to waste in India annually, owing to the lack of bees, and the knowledge requisite in Modern Beekeeping.

IMPROVEMENT IN CIRCULATION.

We beg to thank those interested readers who have recommended The *Allahabad Farmer* to their friends. Every month new names are added to our mailing list, and the amount of correspondence received leads us to believe that this Institute and magazine is serving a need in India.

In a country so large as India, and in other countries there must be thousands of people who would welcome our magazine in many ways. It will be realised that it is practically impossible for the editor to get in direct touch with these, but, no doubt, around your district you could make known this publication.

Where the agriculturist is, the Magazine should go. Can you help? Send us some names of likely relatives and friends. We will gladly send them a copy free of charge. Don't delay, send in the names now.

DON'T MISS THE NEXT ISSUE!

SEND IN YOUR RENEWAL NOW.

TO

The MANAGING EDITOR,
The Allahabad Farmer,
AGRICULTURAL INSTITUTE,
Allahabad, U. P., India.

Date.....

Kindly send me the next four issues of the *Farmer* from above date The cost may be sent to my address per V. P. P. or invoice in foreign countries.

Name .....

PLEASE WRITE IN BLOCK LETTERS.

Address .....

.....

FILL IN THE FORM.
POST IT NOW!

Subscriptions, India, including postage, yearly Rs. 2. Foreign, one dollar or four shillings.

Signature.

WHY NOT BECOME

— A —

SUBSCRIBER

TO THE

Allahabad Farmer?

DON'T DELAY

MAKE USE

— OF —

THIS FORM NOW

SIMPLE SEPTIC TANK CONSTRUCTION.*

MASON VAUGH, B.Sc. AG., A. E.

The people of the world are gradually realising that the problem of disposing of human fæces is of great importance to the health of the human race. Several of the most deadly diseases of mankind are contracted only as a result of the ingestion of miscro-organisms voided with the fæces. The old time methods of diluting sewage by dumping it into running streams, and that of exposure to sunlight and air, can only be used safely where the population is scant and moving. Where people are relatively concentrated, some better method of handling and treating these products, to render them harmless, must be used.

The sewerage of a large city is a problem in itself, and considerable advance toward a solution of this phase of sewage disposal has been made. This paper will deal with the smaller installation required to care from one family to a village. Especial attention will be paid to the problem where running water is not available or must be used sparingly.

The method of using vessels which are periodically emptied into a pit, and the material covered over with dry dirt immediately, is probably safe if carefully carried out; but it seems practically impossible to get it done in such a way that the material is not an attraction for flies and animals. The procedure is unpleasant to both the user and to the one who cleans the vessels; it offends the senses of sight and smell; and, perhaps worst of all, it depends on the constant services of a person. Ancient India very wisely realised that the person who cleaned these vessels is unclean as a result of such work, but, instead of showing him how to cleanse himself, set him apart as permanently unclean and forced his family to share his uncleanness. Thus we have the sweeper, whom we must pity, and whose condition we must improve if possible.

A sewage disposal system, to be usable, must be convenient to use; it must remove the excreta with the least offence possible, and it must dispose of it safely. The septic tank, so-called, seems to meet these requirements better than anything else at present available. It is adaptable, easily worked, and effective. The principle on which it works is that, under suitable conditions, bacteria will liquefy any organic material reducing it to liquids and gases for the most part. The residue, not liquefied, will be an inert, inoffensive material. The conditions are a suitable temperature, between 40 and 125 degrees Fahrenheit, darkness, not

* A Paper, based on a practical demonstration, given at the January, 1930, meeting of the United Provinces Branch of the C.M.A.I., Allahabad.

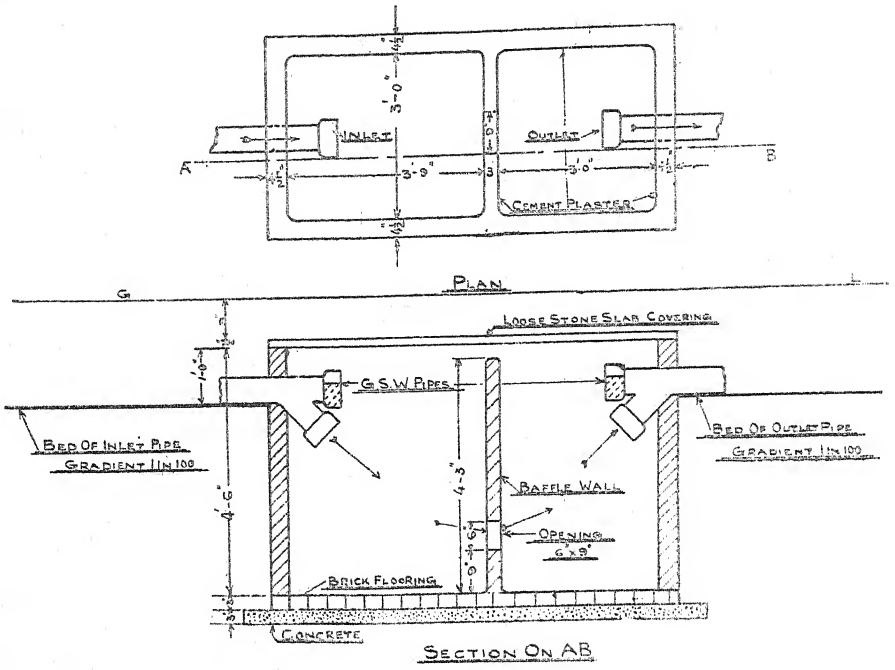


Fig. 1,

PLAN FOR A TEN USERS' SEPTIC TANK.

too much agitation, not too much oxygen, and time. In temperate and tropical countries these conditions can be easily secured by having a tank underground and large enough to hold at least a full 24 hours' accumulation, into which the excrement is delivered immediately, and which is kept full—as much treated sewage being discharged as fresh sewage is added. Figures 1, 2 and 3, show three variations of this system.

There is no standard design of septic tank. Almost anything meeting the above conditions are usable. Common practice has agreed that the tank should preferably be at least twice as long as it is wide, and that the depth of sewage in it should not be less than 3 feet, and preferably $3\frac{1}{2}$ or 4 feet. The tank should be water-tight, so that the liquid level may be kept constant, and so that when necessary, the material may be disposed of at some distance. Within these conditions, almost any masonry material may be used for building the tank. Concrete is good, but unnecessarily expensive in India. Good brick, laid in mortar composed of three parts sand to one part cement, will be the most satisfactory material in most places. Such construction should be plastered inside with the same mortar. The covering of the tank may be reinforced concrete, stone, reinforced brick, or any

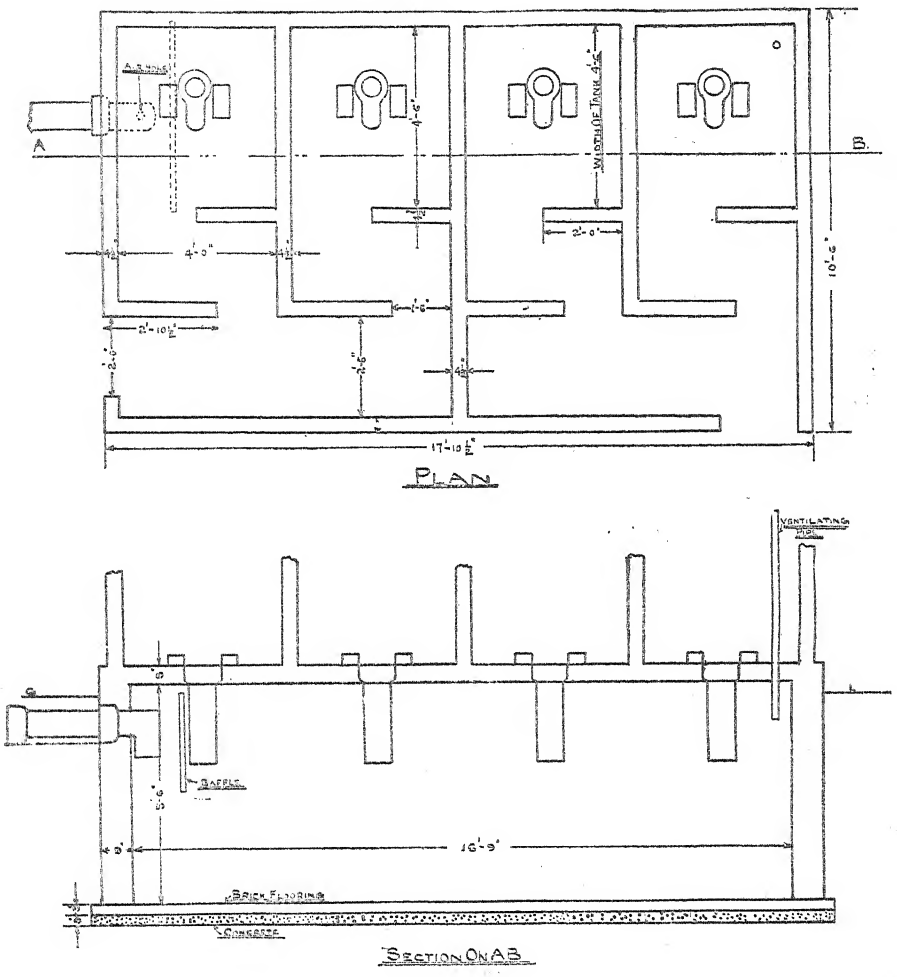


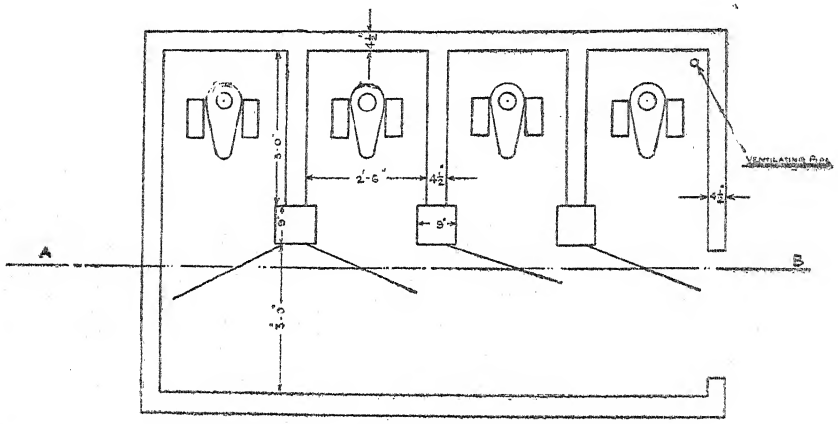
Fig. 2.

PLAN FOR A SIMPLE SEPTIC TANK.

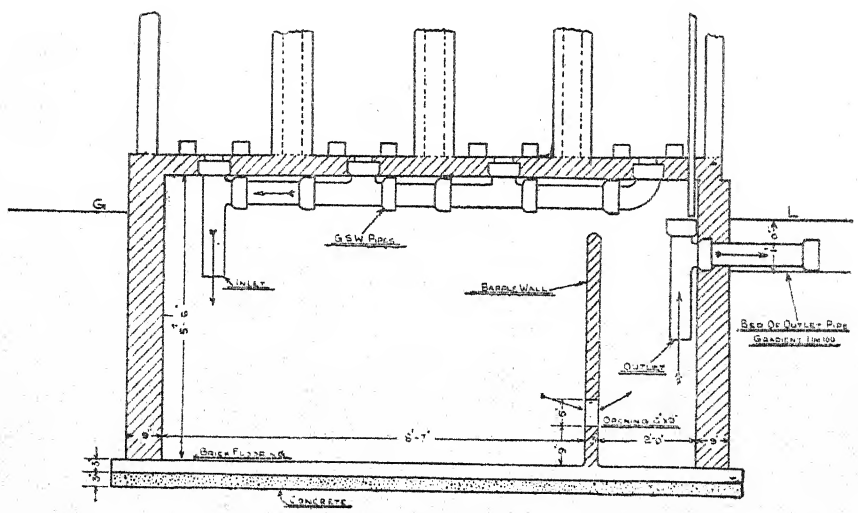
other convenient material sufficiently strong to support the earth covering. Where well-constructed, walls $4\frac{1}{2}$ inches thick (half a brick) are quite sufficient—at least for small tanks designed to serve one bungalow.

There are many and varied types of septic tanks, each designed to have some special advantage. Experience seems to indicate that excessive complexity is at least unnecessary. The essential thing required for the successful operation of the digestion process is one chamber in which it can go on relatively undisturbed. One or more baffles, to prevent agitation due to incoming sewage may be useful. These may be of stone or concrete slabs, set into the

walls just near the inlet and outlet; or they may be nothing more than a thin curtain wall across the tank, dividing it preferably into one-third at the outlet end and two-thirds at the inlet end. This should have in it a hole, 9 inches to 1 foot square, near the floor and near the centre of the tank, to allow easy passage of the sewage from one end to the other. Since there is no pressure on this wall, it need not be thicker than brick-on-edge (3 inches, plus thin plaster). As indicated in the three figures, the inlet and outlet can be constructed in various ways. The essential thing is that the sewage should enter under the surface and leave from



PLAN



SECTION ON AB

Fig. 3.

PLAN FOR A SIMPLE FLUSH LATRINE.

under the surface, because usually a fairly heavy scum gathers on the surface of the contents of the tank which should not be disturbed. If this material enters the outlet, it is likely to seriously clog the disposal pipe. Both inlet and outlet must be ventilated. If elbows are used instead of tees, small holes must be drilled in them to permit the passage of air.

The necessity, or otherwise, of a second chamber in the tank depends on the method of ultimate disposal. In my opinion, there is never any necessity for a third chamber in India. There are three methods of disposal which may be adopted. Under favourable conditions, the discharge may be into a ravine or watercourse. This is applicable under hill conditions, where the watercourse in question is not used for water-supply for some distance below the discharge point, and especially if the ravine is heavily wooded. I should not approve of discharge into a plains river as a matter of principle. The water may be used for irrigation of crops not eaten raw by human beings. For this, it is necessary that the source of sewage be sufficiently above the ground level where disposal is to be effected, to allow the second or storage tank to be entirely above ground. This condition will exist in cases where there is a slope, or where the sewage source is above the ground floor. The storage tank may be of less depth than the digestion tank, which must be of a certain minimum depth, mentioned above, for good digestion conditions. It is, of course, possible to have the storage tank lower than ground level, but this involves pumping, the apparatus for which is expensive if automatic, and likely to be unsatisfactory if dependent on a servant for constant attention. In considering the use of the effluent water for irrigation, it should be remembered that such use will involve balancing the demand for water and the supply. If the area irrigated is larger than the septic tank effluent will care for, additional water can often be supplied. Also it must be remembered that the septic tank does not 'purify' sewage. It merely liquefies the organic matter. This liquefaction depends on the continual growth of bacterial life, which breaks down the organic matter to secure food for its growth. Certain types of protozoa which are feeders on bacteria are usually associated with septic tanks, and, since their feeding is not selective, they eat pathogens and non-pathogens impartially. This undoubtedly results in some reduction of the probability of infection from the sewage: but the two things the septic tank does toward purification are breaking down the organic matter in a way that prevents a nuisance, and making it unattractive to flies. Being unattractive to flies, the chance of infection is materially reduced. It is perfectly possible to utilise sewage for irrigation, provided the supply is enough to justify the trouble, and provided that there is a reasonable

amount of intelligent supervision of the servant doing the work.

The use of the effluent for irrigation is mainly a proposition for schools and large institutions. For individual bungalows, especially where the soil is at all sandy, the most convenient disposal is in underground absorption pipes. These should be laid 1½ to 2 feet below the ground surface, and on a slope of 1 inch in 10 feet. So-called drain tile should preferably be used. I have had tiles moulded by local potters, but, they have not been conspicuously successful. It is possible to get moulds and make cement drain tile, if the clay ones are not available. The tile should be 4 inches in diameter and 1 foot in length, and should be laid with only moderately close joints. A bit of grass, paper, or other material over the joint, to prevent sifting in of dirt until the fill over the pipe has time to settle, is advisable. Care should be taken to see that the tiles are laid on an even slope and that they are not displaced in filling the trench. The latter should be dug only to the correct depth. If the ground is sloping and uneven the tiles may be laid on a contour or curved, to suit conditions. The length of tiles necessary will vary. At my own bungalow, around which the soil is sandy and where four people are using the bathrooms regularly, the tank has only about 75 feet of tile. American practice recommends 50 feet per user: but this need not be followed in most cases. In sandy soil, 150 to 200 feet will usually be quite sufficient. A smaller amount may be installed, and, if found insufficient, more may be added. The tiles need not all be in one line; several parallel lines may be used. It is desirable that the absorption line be laid a little below the outlet level of the tank, and that first 10 feet, if possible, be of sewer tile, with cemented joints, laid on a slope of 3 to 4 inches in 10 feet. Absorption cannot be absolutely instantaneous; in the early morning, when the commodes are flushed frequently, more water may be sent into the absorption tile than it can dispose of immediately. Accumulation for an hour or two, provided it does not exceed the capacity of the pipe, and so disturb the level in the tank, will not do any harm. If, due to the slope of the disposal area, the absorption tile comes too near the surface, a section of glazed tile with cemented joints, and at a greater slope, may be inserted to again carry it to a lower level. The slope of the absorption tile should not be increased. The tile may be put under a lawn, fruit garden, or near a hedge, provided the trees or shurbs are not such as grow with their roots under water, as willows. It may be put under a vegetable garden, but I do not consider it desirable to grow roots eaten raw near the tile. While the danger is small, precautions are desirable. Absorption systems to care for school and hospital installations

should each be designed according to specific conditions *

Lack of a pressure water-supply deters many from installing such systems. For bungalows using flush commodes, water for flushing is essential: about three gallons of water is required to flush once. For ordinary use, a 40-gallon steel oil drum filled daily will be sufficient for a commode. It is comparatively easy to arrange for a *bhishti* to supply this amount. In many cases a small hand pump may be installed. While a pumped supply is certainly desirable, if the sweeper is put to carrying water it will not require an increase of staff and will give increase comfort and convenience to occupants. A tank must be provided somewhat above the commode, but three or four feet is enough. If the roof is flat, the bathroom roof is a good place.

For schools and hospitals, tanks of the type illustrated by Fig. No. 2 can be worked with only the water which the people take in their *latas*, and a couple of bucketfuls to wash down the floor daily. We have one which has been working so for several years without difficulty. It serves 25 to 30 people. This type is recommended only for use by the most primitive people, and where the amount of water used must be extremely small. Where slightly more water can be afforded, the type illustrated in Fig. No. 3 is to be preferred as giving less odour and as working somewhat better. One of this sort has also been working for some months, with only a couple of bucketfuls of water morning, noon and evening to flush it out. This is carried from an adjacent faucet by the sweeper. Of course, it would be better to have this connected with a water-supply and to have an automatic flush, but this is not essential for reasonably satisfactory operation. It is not claimed that latrines of these types are absolutely free of smell. It is claimed, however, that they are much better than the ordinary bucket latrine in this respect, and that they are much more sanitary. They do not eliminate the sweeper, but they do improve his lot by removing the most unpleasant part of his task. They do eliminate the fly practically completely.

The cost of such things is always a factor. School latrines can be built—septic tank and all—for about Rs. 125 per seat as an average figure. Of course, costs will vary. For bungalow commodes, the cost will vary with the quality of fittings used and the plan of the building and site: Rs. 175 to Rs. 200 for one commode only, under favourable conditions, is about the minimum. Five to six hundred rupees would be about the minimum cost for a 3-commode installation favourably located in one bungalow, and

* The author, who is the agricultural engineer at the Allahabad Agricultural Institute, Naini, E. I. R., will be glad to give all the assistance he can, in the desigining of bungalow, schools and hospital septic tank installations, to any reader who may ask for such assistance.—ED.

using good quality low tank commodes. If much piping must be used, either for supply of water or for connecting commodes to tanks, the cost will be proportionately increased.

THE COMMON POULTRY TICK.

By I. P. Caleb, B. Sc. (Hons.) M. Sc.

Ticks are well-known for the trouble they cause to certain domesticated animals. The mouth-parts are adapted for biting as well as for sucking blood. They insert a pair of organs known as *chelicerœ* into the skin when they suck blood. These organs have recurved teeth on them which enable the parasites to fix themselves firmly to their host.

The common fowl tick is known as *Argaspersicus* and belongs to the family Argasidæ.

The body is oval and flattened dorso-ventrally. It is slightly pointed towards the anterior end. The colour varies from light brown to dark brown. Males and females are very much alike, except that the latter are slightly larger. The average measurement of an ungorged female is about 8 mm. in length and 5 mm. in breadth. They expand about 3 mm. all round when fully gorged.

Both sexes are covered by a smooth leathery skin. A few shallow pits can be seen on the dorsal side of the body, especially two oval pits towards the head in the middle line.

During the day the ticks become very inactive and sluggish. They remain hiding on the walls and roof of the poultry shed. They have also been found under the bark of trees growing close to the shed. This habit of theirs makes it difficult to get rid of them. Often the poultry farmer does not even know their existence, though his fowls suffer from the effects of their bites. At night, however, they suddenly become active and attack the birds. They often have to go a long distance to find a host. If carefully watched, one can see scores of ticks climbing the poles to the roost from where they get on to the fowls.

The damage done by these pests is great. Once a tick attaches itself to a fowl it does not leave off until it is fully gorged. It takes a tick from three-quarters of an hour to one hour to engorge itself, after which it looks like a bean seed. This shows that when dozens of ticks get on to a single fowl, the amount of blood lost by the bird must be considerable. A fowl that has been attacked by ticks becomes very weak and does not lay eggs regularly. It usually suffers from diarrhœa.

Besides this, *Argaspersicus* has been found to be the carrier of certain diseases. Fowl Spirochetosis is a fatal disease and its spread has been attributed to the tick. In India a *Spirochete* worm known as *Spirochœta gallinarum* is carried by *A. persicus.* Fowls show signs of disease a week after they have been bitten by infected ticks. Diarrhœa and disinclination to feed are the first symptoms. A kind of drowsiness comes over them and they are sometimes seen lying listless on the ground with their feathers ruffled. The comb takes a pale yellowish colour and the birds begin to get convulsive fits after which they die. In some cases the legs and wings get paralized, and the fowls grow thin till they die in about ten days or a fortnight. Their blood gets full of *Spirochœtes* and are carried to the liver and spleen, which gradually become function less and atrophy. Sometimes a fowl may recover, when the *Spirochœtes* disappear from the blood during the convulsive attacks. A tick once infected is able to transmit the disease for about six months.

The life-history of *A. persicus* is simple and easy to study. Reddish eggs can be found in the cracks and crevices of the fowl-house. Each female lays several hundred eggs. About a month after the eggs have been layed, six-legged larvæ hatch out. Metamorphosis is complete. The larvæ are active and attack fowls during the day as well as at night. They cause severe irritation when sucking blood. They fall off when fully gorged and crawl away to hide. After a week the larvæ cast their first moult and the nymph thus formed has a fourth pair of legs. This creature is more like the adult. It feeds at night only. The second moult takes places after about ten days, and again a third after a week or so. The last moult brings it to the adult stage.

To control these pests, the fowl-house should be kept clean and free from rubbish. Roost poles should be made of smooth wood, without cracks in it. All crevices should be sprayed with kerosene oil at least once a week. Boiling water may also be used. Walls should be wiped with a rag dipped in kerosene or sprayed. It is advisable to throw away and burn all old nests occasionally. Trees round about and inside the poultry yard should be examined by pealing off bits of bark.

In order to make permanent mounts and to study the mouth-parts of ticks under the microscope, the skin and other tissues have to be removed. This can be done by placing a tick in a 10 per cent. solution of Sodium hydroxide in water for about 48 hours. All the soft tissues will dissolve and only the chitinous mouth-parts will remain. These may be dehydrated and mounted on a slide.

In cases where the tick has to be removed from the body of a host, care has to be taken that the mouth-parts which are embed-

ed in the skin, are not injured. A drop of kerosene oil on the tick and skin of the host will make the parasite relax its hold.

SHEEP IN INDIA.

W. J. Hansen, B. S. A., M. Sc.

The observations made on the indigeneous method of sheep husbandry have been limited largely to the local environment of Allahabad. India being such a vast continent, many variations are bound to occur from those herein recorded.

The sheep appear to be kept on grazing only. The sheep thrive accordingly as the grazing is of good or inferior quality, and of sufficient quantity. During the summer months when the weather is extremely hot, the sheep do not graze for many hours during the heat of the day, but take rest and seek the shade. At nightfall, on account of the danger of predatory animals, the sheep are brought into fold. It can be said that even when the pastures are adequate, the sheep do not secure sufficient hours of grazing for their requirements, during at least six months of the year. During the cold season, it is a different matter. Night grazing offers good possiblities if a dog-proof fence can be erected around the grazing area. This, however is not practical when sheep are continually on the move from place to place. For folding at night, a fence of thorns and brush, a couple of feet wide and six feet high, has been used successfully by many villagers. Aside from grazing, no Gadarias, to my knowledge, make provision for a reserve of food. Thus when a scarcity of grazing comes along, the shepherd either sells his sheep, buys fodder at high prices or allows his sheep to fall off in condition and in many cases to die.

In the Indian flock, the Gadaria (shepherd) makes no attempt to regulate the breeding of his flock. In the first place he is so ignorant he just believes that everything is the result of fate and that it does not do any good to try and interfere with the working and pleasure of the gods. The law of the jungle prevails—the survival of the fittest. Nature does not select along the lines that breed a good leg of mutton or a high yield of fine quality wool. Nature's selection is primarily one of constitution and resistance to disease. The rams are allowed to remain with the ewes throughout the year. This practice cannot be too strongly condemned. There is no control or record of breeding and everything is very haphazard. For the United Provinces, the Civil Veterinary Department recommends that the best time for the ram to enter the flock is in September, remaining until December. This makes

the lambing season February and March, a good time for rearing and weaning of the lamb. The Gadaria should also be discouraged from attempting to get more than one lamb a year.

The Gadaria also shears his sheep about three times a year. The wool is so short that its commercial value is materially lessened. Two clippings a year, March and September, should be advocated.

Dipping sheep is not practised among Gadarias. It is too costly, although advantageous. Docking of long tails is not practised. The process is simple. The stroke of a knife and the application of some ointment. Further there is no system of marking or numbering flocks, no record of progeny, no record of the wool clip. The Indian Gadaria rather than treat a sick animal will dispose of it to the butcher. The Indian shepherds are a very ignorant, superstitious and obstinate class of men. They represent the greatest stumbling block to the advance of the sheep industry in these parts. His lot can only be improved by demonstration and education.

At the present time there are no Government sheep breeding stations in the United Provinces and practically nothing is being done to help local breeders in the improvement of the sheep Industry. Co-operative Societies might well turn their attention n this direction in an endeavour to effect some improvement.

EXTRACTS.

Neglect of Sugar Industry in India.

One of the most important agricultural industries of India, namely, sugar, has been allowed to be virtually ruined owing to the apathy of the Government. Some steps have been taken to revive it by the Agricultural departments in the principal sugar-producing provinces, but the steps taken are wholly inadequate to the needs of the situation, as will appear from the fact that the imports of sugar show no falling off ; on the other hand, the quantity of imported sugar has been increasing. It competes with no British industry, and it cannot be said that any vested British interests stand in the way of its development. Sugar is one of the most important articles of food and it is nothing short of a scandal that an agricultural country like India, which possesses agriculturists second to none in the world, should be dependent to such a large extent for this commodity on foreign imports. Those interested in British trade with India deplore the low purchasing power of people and urge the necessity of increasing it. If this industry had been protected, fostered and developed, India would not only

have been supplying her own needs but also exporting large quantities of sugar to other countries. The economic condition of the people would thereby have been appreciably better. For years past the attention of Government has been drawn to the deplorable condition of the industry and to the need of vigorous action to enable it to compete with Java sugar. But the reports of sugar production from year to year reveal a continuous state of stagnation. The representatives of the Bombay Sugar Merchants' Association, who were examined the other day by the Tariff Board, pointed out that India had annually two to three million acres under sugarcane cultivation an acreage which no other country in the world possessed, yet it had to depend upon other countries for the bulk of its requirements of sugar. They rightly complained that Government had done practically nothing to encourage or develop the Indian sugar industry and that 'the valuable recommendations of the Sugar Committee were lying idle.' Among other things they recommended that part of the sugar duty should be utilized for encouraging the indigenous industry in the shape of bounties and advocated the establishment of schools where training in sugar chemistry, technology and engineering should be given and that model farms and factories should be attached to them to enable teaching staff to carry on research work.

LEADER.—*Sept. 17th*, 1930.

HIDE AND SKIN INDUSTRY IN INDIA.

CESS COMMITTEE'S REPORT.

'In point of importance this entire hide and skin industry is one of the most important phases of India's economic life. Its annual gross value runs into as many as 40 to 50 crores of rupees. It not only gives employment to large number of men but is a factor in the economic well-being of millions of India's depressed classes. Any action taken for its improvement will automatically, though, perhaps gradually, help to better their lot. They are among the unorganized and silent submerged strata of the population and have a legitimate claim of the Government's active sympathy.' In these words the Hides Cess Enquiry Committee appointed by the Government of India on the 28th September, 1929, emphasise in their report, the importance of the Government looking at their report for the betterment of all branches of this industry.

The committee, which dissented on many points, has unanimously recommended the creation of a permanent Cess Committee whose functions should be restricted to the problems of *improvement of raw stock* and an organization for handling it both in India and abroad, for the improvement of Indian raw stock, leather goods and allied manufactures. They have proposed a constitution for the Cess Committee which they hold does justice to all the interests concerned, namely, the primary producer, the hide and skin dealer and the commission agent, the exporter, the tanner, the shipper of tanned goods, the departments of the central and local Governments which will be concerned with the Cess Committee's activities and the Indian States. The report warns the Government against disturbing the delicately poised structure proposed for the Cess Committee.

There is a great deal of difference of opinion as to funds needed for the purpose but all the members are agreed that Rs. 5 to 7 lakhs a year will enable the Cess Committee to make a good start and that at the rate proposed the export cess on raw hides and raw skins will yield this amount, but if additional funds are required they should be obtained by raising the rate of cess, provided that the interests concerned are consulted as to the value of the results achieved and express willingness to accept the enhancement of the rate. Per contra, if the review of the committee's work proves the need for a reduction of the rate of cess, it should be reduced.

The report further suggests that, instead of resorting to legislation, the Governor-General-in-Council should be empowered to change the enactment of the Indian Legislature. The committee say: 'On that part of our reference which deals with articles and the rate of cess the following are our considered conclusions :—

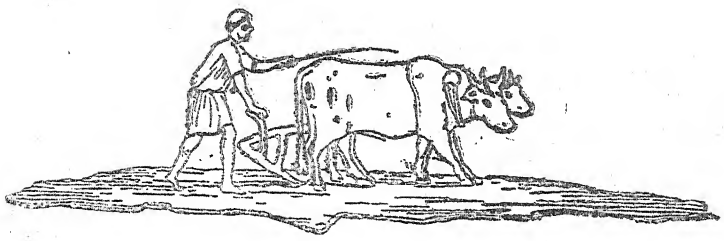
(1) The rate of cess should be one per cent. *ad valorem;* (2) the articles which will be cessed should be raw hides and raw skins; (3) the cess should be on export cess, namely, levied on these articles when exported; (4) the cess should be levied according to the existing export duty schedule of tariff valuations, revised annually as at present by an independent authority. We further recommend that the rate of cess proposed by us should be reviewed after sufficient experience has been gained of the working of the Cess Committee.'

METALS FOR DAIRY MACHINERY.*

REPORT TO DAIRY MANAGEMENT COMMITTEE BY MR. DEWALL, S. H.

Tinned copper, the most widely used material for dairy equipment in all the countries visited, has the disadvantage that the tin coating becomes worn away, leaving a bare copper surface open to contact with the milk or cream, with resulting possible deterioration of the dairy product. Copper alloys, such as monel metal and silveroid, are not desirable substitutes for tinned copper, although often useful for traps and junctions. Aluminium is especially suitable for large holding-vats for milk or cream, and for milk-tubing, but satisfactory results will only be obtained if the metal is free from impurities. It is more resistent to corrosion in the worked form than in castings. Its softness renders it unsuitable for cheese-vats or for milk cans. Experiments are being carried out in the U. S. A. on an alloy of Al and Mn. which has the requisite strength for milk-cans. Aluminium equipment must not be cleaned with caustic soda or ordinary washing-soda, in both of which it dissolves freely. A safe cleansing agent can be made by the addition of ordinary water glass to the washing-soda solution. Nickel is proving useful for dairy equipment. It dissolves to some extent in milk, but produces no serious effects on the flavour. It loses its bright luster after a time. Stainless steel has in some cases given satisfaction, but experience has been so variable, owing to the effect of slight differences in the mode of fabrication, that it cannot be recommended for dairy equipment. The chromium-nickel steels are almost completely resistant to the action of milk and its products, and have given satisfaction in a number of large dairies in the U. S. A. It seems probable that these materials will ultimately replace tinned copper or enamelled steel for many types of dairy equipment.—*Author's summary.*

*New Zealand Journal Sci. & Techn. 11 (1) : 14-25. fig. 1929.



EDITORIAL COMMENT.

Butterfield* and The Reconstruction Unit.

The village problem is being more definitely recognized as more than a one man problem to be tackled singly by the Evangelist, the teacher, the social service worker, the co-operator, the medical practitioner, or the local governing bodies. Butterfield brings to India the idea of Rural Reconstruction unit—a collection of 15—20 villages in a particular centre, where all the agencies at work take stock of each other and work out a broad constructive program.

* * * *

Agricultural training for village padres and teachers.

It may be said that a great deal of the failure in village movements has been due to a lack of understanding of the fundamental agricultural problems on the part of the rural worker. A rural worker must necessarily have an agricultural bias. It has been seen that religious teaching that does not also cope with the problems of satisfying the economic needs of the peasant is largely lost so far as the villager is concerned. Every village padre, teacher and inspector of Co-operative Societies needs and should have a sound agricultural training before embarking upon his village career. The Agricultural Institute is admirably situated and equipped to train village workers so as to give them effectiveness in the work.

* * * *

Impediments to rural progress.

The impediments to rural progress are ; poverty, disease, and illiteracy—and of these illiteracy or ignorance may be said to be the root of superstition, fear and lack of measures to combat disease, etc. The problem clearly lies in the hand of the rural teacher, extension worker and local authorities.

---

*Report of a Conference on Rural Work, April, 1930.
National Christian Council, Poona

Every School a Social Service Unit.

Social service is the noblest of all the services that can be rendered to humanity. The need for it is very great in India where all around us we find so many social evils. Education among the masses, female education, uplift of the depressed classes, the spreading of ideas of sanitation, hygiene, physical culture, better ways of life and rural reconstruction—these are some of the most important problems that we have to tackle.

Happily, the idea is gradually gaining ground with universities and smaller educational institutions that social service should form a part of their curriculum and several such institutions have even started social service leagues of their own. Do you belong to a Social Service League?

* * * *

The Golden Rule.

Let us remember the Golden Rule—a rule that has universal acceptance regardless of colour or creed—"Love thy neighbour as thyself and do unto the other fellow as you would have him do unto you."

Have you a Friend who Would be Interested in this Journal?

Prospective Advertiser please Note!

For the benefit of our advertisers, there are only four fundamentals that must be observed in the drafting of an advertisement. They are:

1st— An advertisment must be attractive so as to be seen.
2nd— It must be short so as to be read.
3rd— It must be simple so as to be understood.
4th— It must be convincing so as to be remembered and acted upon.

How many ads are like that? Read them over and see if each advertisement contains these fundamentally essential points.

Rates of advertising upon application.

Correspondence service.

We will be pleased to acknowledge letters from our readers on any agricultural problem. If we do not have what you want, we will probably be able to advise you where you can get it. In the case of any queries sent in that will have interest to other readers, the replies will be inserted in the columns of the *Farmer*. Feel free to use our service.

Employment service.

During the year, we have received a great many requests for trained men in Dairy and General farm practice. A great number of students upon graduation have been placed in this way. Prospective employers are requested to get in touch with us as to their needs.

* * * *

Co-operative Milk Societies Unions in Bengal.

Discussing the position of milk supply in Calutta and Bengal, Mr. N. N. Bose, Officer-in-charge of Co-operative Milk Societies Unions in Bengal, in an interview stated recently that there were 104 societies affiliated to the Calcutta Co-operative Milk Society Union and the working capital upto June 30 was Rs. 2,80,000. The Union began in 1919 with a supply of half a maund of milk daily to its customers. The supply has now increased to 150 maunds of milk a day. The sale proceeds of milk last year amounted to Rs. 6,08,000. The Union suffered a loss of Rs. 5,000 in the first year of its working. Losses have been completely wiped out and the Union has year by year been gradually increasing its profits so that last year it earned a net profit of Rs. 26,000. The Union has built up a reserve and other special funds which today exceed Rs. 80,000 on which it can safely rely in a lean year. It annually spends out of its profits Rs. 1,000 in aid of schools where children of members generally receive education. It also contributes liberally towards welfare work among the milk producers. It has sunk 25 tube wells and distributed 20 stud bulls, organized four cattle breeding societies and encouraged the cultivation of fodder crops by free distribution of seeds. Till 1926 the Union used to boil a portion of the milk received from its affiliated societies and to sell the boiled and raw milk to its customers. The method was undoubtedly crude and unscientific. The Union has therefore set up a model milk factory in Calcutta after the designs furnished by the Imperial Dairy Expert to the Government of India. The success of the Calcutta Milk Union has led to the foundation of five more milk unions in Bengal notable among which is the Darjeeling Milk Union for the moment primarily a creamery society. The Union is putting up a dairy factory working on the grovitution system, which will be the first of its kind in India.

* * * *

A Suggestion to the Old Boys.

It is now six years since the Indian Dairy Diploma and the Intermediate Diploma in Agriculture courses were started at the Agricultural Institute and during these years something like one hundred students have passed out. It will not be out of place to suggest that we arrange to meet one another once a year at the Institute,

so as to get re-acquainted with each other, thus expanding our circle, and to exchange our views on agricultural subjects. It will be a fine thing for all the past students to meet each other again and a good opportunity to meet the present students and staff of the Institute. It will be a sort of " old boys " gathering of both the courses. This gathering can well be utilized in discussing methods and ways to further our prospects all round. If this, my humble suggestion, is accepted I will request my friends both Dairy and Agriculture men to intimate their names. Upon having a fair number of boys join with me, the date and month of gathering will be settled by consultation. I would request all to join hands in this to make the gathering a success.

Before I close I would request every past student to subscribe to the *Farmer* and to help in increasing the mailing list of subscribers, pertaining to all the problems, troubles and hardships each of us is facing in our daily toil in Dairy farming.

Kindly correspond with :

D. H. Anjaria, I. D. D.,
Manager, Dairy and Poultry Farm,
Baria State, Devgad, Baria, P. O.,
(Rewa Kantha).

Editor's Note :—

The Institute authorities are in agreement with the above noted policy and will do everything possible to the make re-union a success. Do your bit—Get together !

* * * *

Congratulations: Kedarnath and Gajindra.

During the year, we are pleased to note the successful adventure into Commercial Dairying of two of last year's Dairy graduates, Kedar Nath Gupta, and Gajindra Singh.

Kedar Nath with a capital of one lakh rupees has started at Hyderabad, Deccan. Gajindra is already selling ten maunds of milk a day in the Model Dairy—Lahore. We wish both of these men a continuation of their good success. We are expecting that their enterprising initiative will be an encouragement for other young Indians to embark upon Dairying as a career.

* * *

Congratulations.

We extend our heartiest congratulations to Mr. L. Anand Lal Sah, I. D. D., former student of the Institute upon his successful completion of the N. D. D. course in England. He is now trying for the N. D. P., and Diploma in Agriculture. We wish him the best of success and trust that he will find many years of useful service ahead of him in India upon his return.

IN MEMORIAM

We, the students of the Allahabad Agricultural Institute and also the members of the Staff, have come to learn with great sorrow the sad news of the decease of one of the best students in this Institution, Mr. A. T. Dass.

We shall now miss among us a student who was exemplary in his character and a good sportsman.

We wish to convey to the members of his family the fact that we all share with them in their sorrow at his departure, but we also wish to offer our condolence to the father and mother who naturally feel their loss more than any ony of us. We shall also pray that God may comfort them in their sorrow.

THE INDIAN SUGAR INDUSTRY

Book Review.

Khan Bahadur S. M. Hadi, Director of Agriculture, Bhopal State. (F. W. Petch, Thacker & Co., Ltd., Bombay.)

This book is composed of 290 pages including a short appendix. In eighteen chapters the author deals with the Sugar Industry of Bhopal State. He covers the Agricultural aspects of soil and climate, and describes the indigenous system of cultivating sugarcane in Bhopal State. Of the Indian seedlings tried at Bhopal, S 48 is reported to have done the best. The trials with the other seedlings are discussed. He stresses the need for exact information regarding the manurial requiremeuts of this crop. Two chapters are devoted to describing and discussing the indigenous end certain improved methods of *gur* and *rab* manufacture. A chapter covers the processes of white sugar manufacture. The last half of the book details the statements of experiments in manufacture of white sugar direct from cane at Sugar Research Station, Nuzhat Afza, Bhopal.

This book, in many ways a progress report, commends itself to the critical attention of the student and those interested in the problems of the Sugar Industry.

W. J. H.

I grow my own!

BEAUTIFUL flowers are one of Nature's decoations and all the ingenuity of man cannot equal them. Have your own flowers and give that natural beauty to your home. Include in your garden a small vegetable plot and get the best of fresh vegetables daily at a nominal cost - - - -

FRESH VEGETABLE AND FLOWER SEEDS

OF

SUPERIOR QUALITY ALWAYS STOCKED

WRITE FOR FREE ILLUSTRATED CATALOGUE

PESTONJI P. POCHA & SONS

Post Box No. 55, POONA.

A. T. Brooks

THE ALLAHABAD FARMER

A Quarterly Magazine devoted to the extension of Agricultural knowledge in India.

CONTENTS

Vol. 4. January, 1930. No. 1

The Allahabad Agricultural Institute Staff

1. Sam Higginbottom, M. A., D. Philan. (Princeton University), B. Sc., in Agriculture (Ohio State University); Principal, Economics.

2. W. Brewster Hayes, B. Sc. in Agriculture (Oregon State Agricultural College); Department of Horticulture. (On furlough).

3. Mrs. W. B. Hayes, M. D. (Women's Medical College of Pennsylvania); Institute Physican. (On furlough).

4. Mason Vaugh, B. Sc. in Engineering, B. Sc. in Agriculture, A. E. (University of Missouri); Department of Agricultural Engineering.

5. Ira A. Hatch (Cornell University); Farm Manager.

6. Wilmer J. Hansen, B. Sc. in Agriculture (University of Manitoba), M. Sc. (University of Minnesota); Dairy and Animal Husbandry Department.

7. D. Haldar, L. M. E. (Benares Hindu University); Agricultural Engineering.

8. N. R. Joshi, I. D. D. (Allahabad); Dairying.

9. B. M. Pugh, B. A. (Calcutta University), B. Sc. (University of California); Agronomy.

10. I. D. Caleb, M. Sc. (University of Allahabad); Science Department.

11. I. A. Jordan, B. A. (University of Allahabad); English and Library.

12. C. P. Dutt, M. Sc. in Agriculture (University of California); Science Department.

13. S. K. Roy; Assistant Farm Manager.

14. Graham Mathesan, M. A. (Princeton University); English.

THE ALLAHABAD FARMER

A Quarterly Magazine devoted to the extension of Agricultural knowledge in India and the work of the Allahabad Agricultural Institute.

CONTENTS.

THE ALLAHABAD FARMER

VOL. IV] JANUARY, 1930 [No. 1

THE VOICELESS SOIL

Oh! who will speak out for the voiceless soil,
Her face upturned to God;
With her hills and plains and homeward lanes,
And the urge of new-turned sod.

Her soul is the deeps of our human need,
Her heart the smile of Spring,
And her pulse the beat of myriad feet
That o'er her daily swing.

But some still live for their day alone,
And in gold they count their gains;
While the birds fly by with a plaintive cry
To the land where life remains.

Oh! who will give voice to the voiceless soil,
And guard her tenderly:
For the humble clod is a trust from God
For the ages yet to be.

—H. C. GRANT (*Managra*)

Editorial Notes.

Village Reconstruction.

The Indian village is undergoing another stage in its evolutionary progress. This period has been aptly termed the stage of Village Reconstruction. This reconstruction of the Indian village has to do with Sanitation ; adequate provision for the disposal of human refuse, improved facilities for getting a pure supply of drinking water, better dwellings giving access to Sunlight and Fresh Air. Another phase is that of Co-operation. The Co-operation that exists in the village at the present time is largely that of Household Co-operation, where the members of the joint family system work for the common good of that family. The spirit of friendly and commercial co-operation as understood and carred iout in other countries, notably Denmark, is sadly lacking. The Government is not to be blamed in this matter. In fact the Government is to be praised, for in the Provinces we see that Government has set up a separate department to deal with Agricultural co-operation. The fact also remains that these facilities are not being used by the villager to improve his condition. A great deal of spade work remains to be accomplished before the villager becomes educated to the various ways in which he can successsully co-operate.

Just as the Agricultural Institute, Allahabad is not primarily for the training of Indian Christians, but the courses in Agriculture and Dairying are open to all students of any caste in India, having for its aim the improvement of Indian Agriculture through its facilities for teaching ; so it is deemed that the Allahabad Farmer has for its object the diffusion of Agricultural knowledge and practice throughout the country. The Allahabad Farmer is strictly non-partizan and devoted to the extension of Agricultural knowledge among the great Agricultural population of this great land of India. Contributions to our columns from the Rural worker, the Co-operative officer, the Zemindar, the Agricultural Research worker, the Government official, and others are requested so that the vital problems attaching to the agricultural prosperity of this country may be studied and solved.

THE PRINCIPAL'S MESSAGE.

The Principal wishes all friends of the Institute a happy and prosperous New Year. He hopes that 1930 will be the best year yet.

The year just closing has been the most memorable in the history of the Institution. Progress is recorded in the number and quality of our student body, in the success of those who appeared in the various examinations, in the work former students are doing. The development of the apprentice classes because of the demand for men trained to handle farm machinery, has continued. More large-scale Indian farmers have learned that the machine makes the man dear and the product cheap, so that agricultural machinery is in greater demand, with work for those trained to use it.

The staff has suffered the loss of some of its members going on furlough, or returning to America. The addition of qualified men to enable us to meet our obligations has been successfully accomplished.

The building of the Farm machinery building, the gift of Mr. J. H. Schiede and Mrs. J H. Caldwell has gone on, and as fast as one part is completed it is brought into use ; and we are still short of room.

Also equipment for this building is being fitted as funds permit.

The department has done some research work on farm tools and implements; has put on special courses in tractor farming; has given demonstrations in connection with the local Agricultural Association. This department needs enlarging to meet the increasing opportunities.

The Animal Husbandry and Dairy Department has also shown great forward strides. Owing to the generous gift of Mr. and Mrs. James J. Forstall of Chicago the department has purchased over fifty head of livestock—cows, calves, and water-buffaloes. The cows are part of the extensive breeding programme. Having all these milch animals gave the students plenty of milk for butter and cheese-making and other manufacturing processes. Heretofore, we have had to buy milk for the manufacture of cheese. In spite of the best supervision we were able to give, the milk was adulterated, with a poor quality cheese as a result. Also the students had much better practice in dairying.

Owing to the generous Christmas gift of the Church of the Covenant, Cleveland, Ohio, we were able to secure some of the very urgently needed laboratory apparatus. This also helps to give the students better training. Much more is needed before the Laboratory is adequately equipped.

The farm department, even in a very bad fodder year, has been able to fill seven siloes, averaging 20 feet by 25 feet. So our cattle have enough in the "fodder bank" to last over till the next crop is harvested. Five of the siloes are filled with sorghum and maize, two with weeds and grasses that ordinarily the cattle will not eat. When we first took over the land, if the whole farm had been cropped to fodder we could not have filled three siloes. This year on about half the land we filled seven. This shows an increase in fertility. Again on part, the soil reclamation project, we grew rice for the first time which gave an excellent yield; this land is now under Pusa 4 wheat. In 1912, some of this land was offered on rent for eight cents an acre, with no takers. This year a villager has rented two acres and wants to rent more, at a net rental of fifteen dollars par acre per year. This department has supplied improved seed to many village farmers.

The Horticultural Department is marking time until Mr. and Mrs. Dr. Hayes return from furlough. He is urged to raise about thirty thousand dollars for buildings and equipment for his department. At Allahabad very large crops of improved fruits and vegetables can be grown. They ripen early and all together. The market is then glutted for a short time and prices do not pay. The Horticultural Department wants to experiment to lengthen the season; also to preserve the surplus for use when there are few vegetables in the market.

A friend in America has given money for a bungalow.

During the year negotiations were carried on with the University. We have hopes that the degree course in Agriculture will soon be part of the syllabus of the Allahabad University. The Institute has agreed to open a special course for training in agriculture and better living for thirty village-school teachers from July 1930. The relations with the Indian public and the Government have been helpful and happy.

The student life has been very full. The literary societies, games and social service in the villages have enlarged the experiences and horizons of many. Many guests, Indian and foreign, have visited the Institute; the most notable being Mr. Gandhi.

The Institute is grateful to its many friends, old and new, Indian, American and British, who continue to support it. Through their generosity and good-will it has come to its present unique state of service as a Christian educational institution. Its place in India is to be, as its Master, the servant of all.

The needs of the Institute will increase. The reward for successful stewardship is greater responsibility and not less. The man who made ten talents for his lord was given more to do.

So we face 1930. Thankful for the past, eager for the year ahead, full of hope; we pray for courage, and faith and patience that every one connected with the Institute may continue to do with his might, what his hand finds to do.

SAM HIGGINBOTTOM.

NOTE ON THE POSSIBILITIES OF ORGANISING THE DAIRY INDUSTRY ON A CO-OPERATIVE BASIS BY THE CO-OPERATIVE DEPARTMENTS IN INDIA.

BY WM. SMITH.

Imperial Dairy Expert.

In the first place it seems advisable to refer to the necessity for the development of the dairy industry in India as an integral and necessary part of any scheme for the improvement of Indian cattle.

According to the latest figures available there are in British India some 45,793,625 adult bullocks and 37,885,686 adult cows. Assuming that 90% of the above bullocks are actually required for the cultivation of the soil and that the average life of a working bullock is 9 years, British India requires to breed 4,579,362 bullocks per annum to carry on the work of cultivation. To do this only some 1,400,000 cows are necessary, so that in addition to this number India carries some 24 million cows not required for bullock breeding purposes. If these figures be accepted the most pressing and immediate problem in connection with Indian cattle breeding seems to be the economical use of her surplus cows.

It is probably correct that some fifty per cent of the people of India are meat eaters in some form or another, but it is certain that a very large proportion of this fifty per cent do not eat beef and are unlikely to become beef eaters. The Parsis are meat eaters but most of them will not eat beef. In the great majority of the Mohammadan villages of Northern India oxen are not killed and eaten with the exception of one or two animals slaughtered for sacrificial purposes once a year at the "ID" festival. Then again a great number of low caste people who have no objection to meat eating really eat very little animal flesh of any kind in their ordinary diet, so that notwithstanding the apparently large numbers of non-vegetarians in the country India's surplus cows are not likely to be killed and eaten. The utilisation of cows as work cattle in India is practically unknown. Popular opinion, or sentiment if the word is preferred, will not permit the cow to

be put to the plough or harnessed for draught work of any kind, and we are therefore forced to the conclusion that India can only obtain a suitable return to pay for the feed and keep of her surplus cows by using them as milk producers, or better still by developing the cattle of the country so that all cows will at one and the same time serve as the mothers of efficient draught cattle and yielders of a reasonable quantity of milk, which means the development of a dairy or milk industry throughout the land. I am well aware that this assumption means the acceptance in our breeding policy of the dual purpose cow, a policy at one time regarded as debatable and even doubtful by some authorities, but I think that to-day all schools of thought who have studied this question are prepared to admit that milk production must be one of the factors in our breeding policy, and the debatable part of this question is now narrowed down to the quantity of milk which we shall aim at in our dual purpose policy. Indian cows on the average give such lamentably poor yields of milk that at the present moment the quantity of milk which shall be expected from our cows need not worry anyone. Improvement in this direction will be slow, the aim of all breeders should be to make it sure.

If then it be accepted that milk production be one of the factors to be arrived at in the development of Indian cattle, a study of the methods employed by the countries which in the past half century had made the greatest progress in this direction seems advisable. It is a remarkable fact that in countries like Denmark, Holland, Sweden and New Zealand, which have made enormous strides in the improvement of their cattle in the last fifty years, the organisation of the dairy industry, *i. e.*, the utilisation and sale of milk and milk products, preceded in every instance the general improvement in their dairy cattle. In other words in these countries it was not until the cow owner was assured of a ready and profitable market for his milk that he could be induced to realise the value of a better cow, of better feeding, and of all round cattle improvement, and it does not seem unreasonable to suppose that the same path must be followed in India. If and when the Indian cultivator can be given a profitable cow, and if and when he can be assured of a fair price for the product from his cow, then and then only will he feed and treat her properly, and then and then only will he ever strive to improve the quality of his cow and to respond to propaganda for careful breeding by selection. The cow must always be the mother of the bullock and to get a better class of work cattle we must have better cows.

India is a country of small holdings and in every country similarly situated where the dairy industry has made progress, the development has been on co-operative lines, so much so that in the most up-to-date dairy countries of the world to-day the utilisation

and sale of the milk of the individual cow owner is almost altogether co-operative, *i. e.*, the farmers united together in the form of co-operative dairy societies, themselves sell their milk and the products manufactured therefrom and thereby retain for themselves the whole of the profits from this business. In Ireland, in Denmark, in Holland, and in New Zealand proprietary creameries or milk handling concerns are practically unknown to-day. The milk producers organised co-operatively do all the manufacturing, grading and selling of their milk and its prepared products. Milk is the most perishable of all farm produce and to convert it into a non-perishable product of the highest market value requires capital, technical knowledge, and business ability which the individual cow owner cannot hope to possess, so he must follow the example of the rest of the world and organise or be organised on co-operative lines in order to obtain for himself the full value for his milk.

All the Indian provinces have Government departments for the organisation of agricultural co-operation and if this country is to make real progress in the direction of cattle improvement one of the first steps to be taken is the organisation of co-operative societies through the agency of the Government co-operative departments for the utilisation of milk and all its products. The cow owner who sells ghi to a dealer at As. 12 per lb. when the world's value of butter fat is twice that figure is not likely to feed his cow properly nor to strive to obtain a better cow. Co-operative dairying is not unknown in India. The success achieved by the co-operative departments of Bengal and Madras in organising the milk producers in the vicinity of their capital cities is well-known and the old-established and successful co-operative dairy society at Telnkeri near Nagpur is a further proof of what can be done.

DAIRY BACTERIOLOGY.

W. J. Hansen, B. S. A., M. Sc,

The science of bacteriology is comparatively recent in its development. It dates back to the invention of the simple lens by a Dutch lens maker by the name of Leewenhoek in 1683. He made a lens, that, crude as it was, gave considerable magnification. He first observed bacteria in the tartar from teeth. By means of his lens and observations he was able to convince the Royal Society of England that there existed living things too small to be seen by the naked eye. For the time, his drawings are excellent.

The relation of bacteria to disease, however, was not suggested until later, about the year 1847. In the year 1866, the noted

French Scientist, Louis Pasteur, connected the souring of milk with bacteria. In spite of these early advances, it has only been recently that the knowledge of bacteria has been seriously applied to Dairying.

Briefly stated, there are three periods in the history of bacteriology. The first period is called the "Theory of Spontaneous Generation." During this early period, people believed that living things originated from nothing. It is recorded that Virgil in 25 B. C. believed that frogs and worms could originate from meat that had rotted. His writings also tell us that if you kill a two-year old ox whose horns are just beginning to curl, then place it in a narrow enclosure, cover with leaves, then soon from his internal humors a swarm of bees will arise. Other ideas also convey the belief in the spontaneous generation of life. Von Helmot believed that if a pot of corn is taken, corked up, placed in a dark place, add a dirty shirt, and leave for 21 days then the ferment arising from the combination will form young, vigorous, healthy rats. It remained for Redi, in 1668, to disprove this theory. His experiment was simple. He placed meat in two pans, one covered, the other uncovered. He found that the uncovered pan of meat developed maggots, that the covered pan did not develop maggots. His conclusion was that flies are responsible.

The next period marks the development of the "Germ theory of fermentation and decay". It was Pasteur who proved the theory by his experiments on the souring of milk and the production of alcohol by yeasts. Such a vast amount of evidence was accumulated that the old ideas of the "Spontaneous generation of life" were rejected and belief became common that decay and fermentation are due to micro-organisms.

The modern theory of disease germs originated somewhere back in 1762, and was first suggested by Pleney. He offered no proof. It was Davaine, in 1863, who made the first satisfactory demonstration that each disease was caused by a specific organism. His major work was with Anthrax. In the same year, Pasteur showed that the silkworm disease, then ravaging in France, was due to a protozoan parasite. He developed laboratory methods to deal with same. A few years later the work of Koch gave an impetus to laboratory work, for he originated solid media and pure culture work. During the same decade, Weigert made an important contribution by devising staining methods.

Today we have pathogenic, water, food, soil, dairy and other branches of bacteriology. The knowledge of bacteriology has brought great lessons to us for the need of cleanliness in all departments, it has solved the problem of great economic losses in the handling of foodstuffs. Having briefly considered the

historical aspect, we shall now consider the morphology of bacteria, and some of the important reasons why a knowledge of bacteria is necessary in Dairying.

Sources of bacteria in milk.—During recent years many studies have been made to determine the sources of the bacteria found normally in milk. Knowing, then, the sources of contamination, methods can be devised to reduce the count. The sources are very numerous and will vary with the conditions under which the milk is produced. A few of the most important are here stated.

Milk as it leaves the udder is never sterile. The probable average is about 500 bacteria per cubic centimetre. There is no definite flora of the udder. The flora will vary with the individual cow and from place to place. It is found generally that the udder count is high where some infection is present. The common infections of the udder are Mastitis, Tubercolosis, Sreptococcus and B. Coli infections. It is safe to say that under Indian conditions of milk distribution, milk is highly contaminated. The writer has observed milk from cows, suffering from udder infection, from villages, going to the consumer daily. The *Gwala* cannot afford to safeguard his patron by withholding such objectionable milk. At farms where the cows are medically examined daily and kept in a fit condition, the milk will be of superior quality.

The body of the cow.—Is the body of a cow ever clean ? It is safe to say that the body of the cow is always highly contaminated with dirt and manure. This dirt and manure is high in bacterial count. As a precaution, the body of the cow should be washed and well wiped off before milking. This is done on farms under efficient supervision.

The stable air.—The air surrounding the place where cows are kept is always highly contaminated, especially in dry weather because dust is present everywhere. Dust from the feed, hay, ground, etc. fills the air. An open pail for milking is highly undesirable. A small mouthed opening to the pail is desirable.

The utensils into which milk is placed.—Recent experiments abroad have shown that the utensils are the greatest source of bacterial contamination in milk. This is because the utensils are never properly cleaned. They may appear clean to the eye, but they are not bacteriologically clean. Methods of chemical sterilization have proved to be fool proof and very efficient. Repeating, the utensils are probably the greatest source of contamination of bacteria in milk.

The milker as a source of contamination.—The hand and body of the milker is adefinite source of bacterial contamination in milk.

Wet milking, that is using wet hands, should be prohibited. The milker may also be a carrier of Typhoid fever. Many men are able to pass on the disease without suffering from the disease themselves. They are called carriers. All milkers should be examined medically to be sure that they are free from the enteric group of diseases. This is done in Dairies run along up to the minute lines.

Nature of Bacteria.

Definition of bacteriology: It is the science which treats of the forms, habits, growth, reproduction, and life processes of bacteria. Bacteria are microscopic, unicellular, nonchlorophyl masses of protoplasm, occuring in the form of spherical, cylindrical, or spiral cells and reproducing by fission and belonging to the plant kingdom. Protoplasm is a mysterious, jelly-like mass or substance which is the basis of all life. It constitutes in its various forms, the actual living, changing part of every living thing.

Structure of bacteria.—Because the bacteria are so small, the structure is hard to determine. There are four headings for discussion:

Cell wall.
Capsules.
Cell contents.
Organs of motion.

Cell wall.—The bacterial cell wall is a relatively firm membrance surrounding the living matter or cell contents. The chemical composition of the cell wall differs in different bacteria. Some cell walls give a characteristic cellulose reaction, others give a characteristic chitin reaction. (Chitin is the insect body covering material.) The cell wall is probably a protective membrane. All the food taken in by the cell must pass through the cell wall by diffusion.

Capsule.—A capsule is a very much thickened, gelatinous outer portion or covering of the cell wall of some bacteria. It is usually partially soluble in water. Thus when growing in solutions, the solutions become slimy and gelatinous.

Cell contents of bacteria.—Protoplasm or living material of the bacterial cell fills the interior. The outer layer, the portion next to the cell wall, is known as the ectoplast. This portion is important in cell nutrition, because it exercises the power of selective absorption. It determines what substances can leave the cell and which substances can enter the protoplasm. A definite nucleus such as found in the higher plants is absent in the

bacterial cell. Granules, often behaving like nuclei, often appear in the cell. Each have characteristic staining.

Organs of motion.—Many species of bacteria have the power of independent movement when in suspension in a suitable liquid. This movement is due to the presence on the bacterial cells of one or more delicate, hair-like, appendages, termed flagella, or whips. These are probably outgrowths from the protoplasm. They are very delicate and easily break. They can only be seen by special methods of staining. Bacteria swim with the flagella pointed towards the front. The latter move rapidly in a cork-screw fashion and pull the organism along. A few species of Cocci, many of the spirilla possess flagella. The number and location of the flagella have been used in differentiation and classification.

Morphology of Bacteria.

Shape of bacteria.—Under the heading of shape of bacteria, we have three main groups :

Coccus, Rods, Spirillium.

Coccus.—Under the name of coccus many different varieties occur. The Diplococcus appear in pairs ; the Streptococcus appear in chains, the Staphylococcus appear as bunches of grapes ; the Sarcina appear as in packet formation.

Rods.—Those bacteria which appear as rods are named in two ways. Bacillus are those which produce spores. Bacterium are those which do not produce spores.

Spirilium.—This type of bacteria is easily indentified, because they always appear in spiral form.

Size of bacteria.—Bacteria, of course, vary in size. The length varies from 0.5 to 5 mu in length. The diameters vary from 0.25 to 1.0 mu. One mu is one twenty-five thousandth part of an inch, or one thousandth part of a centimetre. The above is average only. It has been estimated that there could be 8,000,000,000 in the space the size of a pin head. There can be 100, 000, 000 in a single drop of milk. These organisms cannot be easily handled individually. It has been estimated that 1 ,000,000,000,000, would weigh one ounce. This gives one an idea of the number of bacteria that could be found in milk if not produced under sanitary conditions.

The distribution of bacteria.—Bacteria are found practically everywhere, except high in the air, or deep in the soil. They are present in air, dust, soil, feed, utensils, water, on animals, the hands, and the mouth. Many of these bacteria are benefical to mankind, others are a danger; the latter are called pathogens, because they produce disease.

How do bacteria reproduce.—There is no sex in bacteria, no male and female. They reproduce themselves by splitting transversely, by what is called fission. Yeasts on the other hand reproduce by production of buds, or ascospores. Mould reproduces by the formation of spores or by fragmentation. The keeping quality of food products, and especially dairy products, is directly related to the growth of these micro-organisms. When conditions are right for reproduction, the increase is rapid and food spoils quickly.

What are some of the products of growth of bacteria in milk?—Some of the products of growth can be seen by the naked eye. The souring and peptonizing of milk are such evidences. In the sweet souring of milk, where curd is precipitated, we can be sure that peptonizing bacteria are present and in great numbers.

The Important Factors Influencing the Growth of Bacteria.

Food.—Bacteria have specific food requirements which pass through the ectoplast. Milk offers the most complete food for bacteria that we know of. A thin, hygroscopic layer of milk in a vessel will be sufficient to provide food for millions of bacteria.

Moisture.—Bacteria are unable to assimilate their food dry or in this state. The food must be in solution before it can be utilized. Usually at least 30% solution is required. This information is important. It indicates, as has been proved experimentally, that dry utensils offer poor conditions for bacterial growth. A utensil may be properly cleaned, yet if not DRY offers a condition where bacteria may exist.

Air.—All bacteria do not require air for their existence. The types of bacteria that require air are called Aerobic. They require oxygen for growth. Anerobic types are those that do not require oxygen from the air, because they get oxygen from the decomposition of food. They can live in the absence of air. Faculatative bacteria can grow under either condition. They can exercise the option.

Temperature.—The temperature requirement of bacteria varies with the type. Psychrophilic bacteria grow best at around 10 degrees Centigrade. Mesophilic bacteria grow best at around 37 degrees Centigrade, while Thermophilic bacteria grow best at around 45 to 50 degrees centigrade.

From the foregoing it can be seen that in the control of bacterial growth, food, air, moisture, and temperature conditions must be taken into consideration.

CLIMATOLOGY OF COTTON.

By C. P. Dutt, M. Sc.

We know that conditions of climate, particularly temperature during growing seasons, rainfall, and length of the growing season, are the chief causes which determine station and distribution of plants ; and it is of the greatest importance to science to know exactly the manner in which these influence the northern and southern limits of cotton production. To arrive at this solution, we must first, though as shortly as possible, employ ourselves with the observations which have been collected on these factors in cotton regions, over the entire globe. These observations will point towards the production of cotton. These will also give us the most optimum conditions for the growth and fibre production of the cotton plant.

In the West Indies the temperatures range between 77 degrees and 82 degrees during the growing season of the cotton plant, and frosts are but seldom known. There is a short wet season during the first part of April. This is followed by a dry season in which the temperature remains almost constant at 80 degrees. During July and August the heat is very oppressive, while the Summer is very dry. Then another rainy season occurs about October first and lasts until December, when a dry season begins and lasts until April. The mean annual temperature is 7[illegible].5 degrees. The maximum temperature is 87 degrees, and the minimum temperature is 75 degrees. The annual rainfall is 54.47 inches.

British India is one of the most important countries that is now engaged in the cultivation of cotton, and a meteorological comparison is essential for that reason. And also because it is the country with which we are most concerned. This makes it important in our discussion of the subject. The seasons in India are divided into hot, cold, and rainy. The country extends from the torrid zone far into the north temperate zone with stations widely scattered. These stations give marked differences of temperature and rainfall. The climate is greatly influenced by the monsoon. Great extremes of temperature and rainfall precede and occur with the monsoon. All India does not, however, suffer from this. The mean annual temperature of Bombay for the cotton year is 90 degrees. The mean Summer temperature at Calcutta is 82.5 degrees. The temperatures are given in table I for the stations at Dehra Dun, Amraoti, and Surat.

TABLE I

Stations.

Months.	Surat.	Amraoti.	Dehra Dun.
January ..	71 degrees ..	63 degrees .	52 degrees
February ..	75 degrees ..	76 degrees ..	59 degrees
March	80 degrees ..	83 degrees ..	67 degrees
April	85 degrees ..	90 degrees ..	73 degrees
May	88 degrees ..	95 degrees ..	81 degrees
June	87 degrees ..	93 degrees ..	86 degrees
July	84 degrees ..	79 degrees ..	83 degrees
August ..	81 degrees ..	78 degrees ..	81 degrees
September ..	82 degrees ..	80 degrees ..	78 degrees
October ..	81 degrees ..	78 degrees ..	73 degrees
November ..	75 degrees .	73 degrees ..	57 degrees
December ..	72 degrees ..	63 degrees ..	56 degrees

The station at Dehra Dun is at an elevation of 2350 feet. The cotton is grown successfully in canal colonies of the Punjab which is several hundred miles farther north from this station. The mean annual temperature for Dehra Dun is 70.5 degrees. The rainfall is quite variable throughout the country. But in regions of cotton production there is considerable rain. At Calcutta the annual rainfall is 64.0 inches, although the rainy seasons are variable in India.

Mexico : the area in which cotton is grown, is very small. It is limited to the region around and near Vera Cruz. The range of temperature from the hottest and the coldest months is only 12.4 degrees.

In Australia cotton is also grown. The temperature range during the cotton growing months is from 60 degrees to 100 degrees. The mean annual temperature at Sydney is 62.4 degrees. At Victoria the mean annual temperature is 56.8 degrees. During the entire year the temperature ranges from 27 degrees to 111 degrees.

Brazil grows some of the most excellent cotton. It is due to the fact that Brazil is purely an equatorial country. The temperature is quite uniform yet high enough for the good production of cotton. The mean annual temperature for Brazil is 78.8 degrees.

Argentine Republic occupies about the same position in the southern hemisphere as that occupied by the United States in the northern hemisphere. Its contrast seems best with the United States. The range of temperature at Buenos Aires during the growing season is 48 degrees to 100 degrees. The annual mean temperature for the cotton growing months is 76 degrees. The cotton grows in this country both as a perennial and an annual, and the culture is increasing each year.

Egypt is a country almost rainless, and the cotton in this country is grown mainly by artificial irrigation. The temperature in Egypt varies considerably between lower and upper Egypt. In lower Egypt the mean temperature ranges from 80 degrees to 90 degrees in summer. In upper Egypt the mean temperature ranges from 90 to 100 degrees in summer.

In the United States the climate of the Cotton Belt is also variable as climate always is, and the outer boundaries of cotton production are determined entirely by climatic factors. The Cotton Belt has an average Summer temperature of 77 degrees along the northern boundary. This temperature is about the limit beyond which commercial production becomes unprofitable. In the southern portion of the Cotton Belt the Summer temperature is 80 degrees to 85 degrees, and in the Imperial Valley in California it averages 95 degrees. Along the northern margin of the Cotton Belt the last killing frost in spring occurs, on the average, about April 10, and the first killing frost in the Fall about October 25, so that the frostless growing season is about 200 days. In the southern portion of the Cotton Belt the last killing frost in Spring occurs about March 10, on the average, and the first killing frost in the Fall will seldom occur before November 25, the frostless growing season being 260 days or more. The average precipitation annually in the Cotton Belt ranges 23 inches in Oklahoma and Texas to 55 inches in Eastern North Carolina and 60 inches in Southern Mississippi. The rainfall is heavier in the Mississippi Valley States, than in the South Atlantic States, or in Texas during the Spring. The Spring rainfall ranges from 6 inches in Western Texas to 16 inches in Arkansas and Southern Mississippi. The Summer rainfall is somewhat heavier than that of the other seasons, especially in the Southern and Eastern portions of the Cotton Belt. It reaches the maximum of 20 inches in Southern Mississippi and in Eastern South and North Carolina. While in Texas in the region of the Black Prairie, the

amount received averages only 8 inches. Fall is the driest season of the year, all the important Cotton regions receive less than 10 inches of rain during the Fall months. February and November are the wettest months of the year, in the Mississippi Valley States, Alabama, and Northern Georgia. August is the wettest month in the Carolinas and May is the wettest month in Texas and Oklahoma. The months of October and November are the driest almost throughout the entire Cotton Belt.

The General Climate During Land Preparation.

The winters of a region should seldom be severe, and the temperature should seldom fall to the freezing point. The freezing weather is found more in the northern latitudes and places where the temperature falls that low, often, that region is not suited for the successful and economic production of cotton. It is a fact recognised by cotton planters that the portion of the country where the temperature falls rapidly and the fall reaches the freezing point during the winter several times or during early winter, the season is too short between frosts for profitable cotton production. The season is found to be too short for the cotton plant to mature its fruit or perfect its growth.

In the Cotton Belt of the United States the months of February and March are spent by the farmers in preparing the land for planting, the season is well adapted for this work. The lands are generally plowed broadcast during the winter to permit the penetration and storage of moisture in the soil and to prevent run-off. In India the land is prepared and the seed planted before the beginning of the monsoon. The land should be plowed and left cropless for at least one month if not more before planting the seed. This will permit great Biological, Chemical, and Physical changes to take place in the soil.

The Climate of the Seed-Planting Season.

The danger of frosts should generally end before the seed is planted. There should remain no danger of the young cotton plant becoming killed by cold after planting. It is customary to plant the seed in the ground about June 1, the time depending largely upon the locality. If the cotton is planted before the first of June the plant is generally reduced in vitality by the scarcity of moisture that occurs about this time with the exception of the irrigated distrtcts. In northern regions where frost is frequent it is customary to plant from April one to May ten, the time depending largely upon the locality. In these regions

if the cotton is planted before the fifteenth of April it is generally reduced in vitality by the cool nights that occur about this time. In many places light frosts are common, producing occasional killing of the plants. These frosts retard the growth of vegetation during the first weeks of April, particularly in the extreme Northern portions of the Northern cotton growing countries. The planting in these regions is delayed to evade this unfavourable temperature.

The month of April is full of showers in the Cotton Belt of the United States and therefore is considered a good planting month where the showers are not extremely heavy. It is a fact well known to scientists and cotton growers that if soil becomes too heavily charged with water while the seed is undergoing a stage of transformation prior to germination, decay frequently sets in, and on the other hand, if the soil is very dry, rendered by the absence of rain or under the influence of drying winds, the seed cannot obtain enough moisture to start growth and replanting becomes necessary. Again, if the soil contains a sufficiency of moisture for the growing plant, and if the nights in early April are cool, the rapid evaporation from the leaf surface under the action of the winds may reduce the temperature so low as to seriously damage the organic structure of the tender tissue. When chilling winds and not solar heat are the agents at work creating the circulation of moisture in the plant and reducing the amount of surplus water in the tissue, the young plant is greatly endangered and the vegetable organization is frequently disarranged or ruptured. If the wisdom of the cotton planter brings about the delay of the planting until the favourable conditions have arrived, the soil is warmed by the sun, and the number of cool days are reduced to the minimum or the scarcity of water is met by artificial means.

The rain should be well distributed throughout the early part of the growing season. This is best suited to the optimum development of the cotton plant. The rain should be just right to make the plant send down its root system and acquire a firm hold on the soil and the taproot should be sent deep down into the soil so that plant may successfully survive the drought of the months following the rainy season. A wet growing season will cause the plant to throw out numerous fibrous roots near the surface and no deep taproot is sent down. The drought will cause the plant to wilt and the squares will drop off of the plant. A season too wet evidently is not best for the optimum development of the plant to meet the conditions of drought through the dry months. Where this exists the plant must be given water by artificial means or the production of cotton must be discontinued. But on the other hand if the seedling period is comparatively dry

with occasional showers several days apart, the plant sends the tap and lateral roots deep into the soil and subsoil, thus securing a deep and firm hold in regions where there is abundant moisture food during the period of summer drought. During this period the plant is able to secure sufficient moisture from below to sustain the vitality of the plant during the fibre-forming period when there is plenty of sunshine and dry weather.

The cotton plant loves the sun, and during its entire life must have an extra quantity of warm rays. About June 1 or May 1 when the seedlings are tender and above the ground is a very critical period in the life of the plant. The cold or not dry weather at this time not only checks the growth temporarily but stunts the plant that it never regains its former vitality and such a plant or field of plants cannot be expected to produce the maximum and best quality of fibre. The range of temperature should be about 80 degrees to 95 degrees.

Soil temperatures are very important to determine the seed-planting time. These temperatures show to what extent the heat of the sun has penetrated the soil, and the power of different kinds of soils to retain this heat to meet the requirements of the germinating seed. The writer regrets that there has been no work done along this desired direction, in connection with cotton. Work has been done by botanists with other seeds but these cannot serve our purpose.

Climate Necessary During the Growing Period of the Plant.

The growing period of the cotton plant may be said to be the period from chopping-out to the appearance of the first boll. During this period the plant requires a large amount of intense sunlight and favourable moisture conditions. If moisture is too abundant it causes too much vegetative development at the expense of the fruit. This is of course not desired and only sufficient moisture is needed to meet the demands of the plant, with what it needs and at the same time not make the soil saturated with water. This would produce too many surface roots that would make the plant suffer later in the period of drought. Humidity is not essential for the best development of the cotton plant. Most authors give this as an essential requirement but cotton is produced in arid regions and is not therefore restricted to regions of humidity. The proper amounts of moisture may be supplied by artificial methods through irrigation as is done in dry regions. Much rain during June and July is decidedly injurious to the plant because if water is allowed to accumulate in the flower in the cup formed by the petals, and sepals, rapid decay will take place, caused by the gelatinous substance generated at the base of the

flowers, the forms will shed-off and cause a decrease in the yield. At this stage the intense rays of the sun are needed to keep the very delicate cotton flower from falling off. Much rainy or cloudy weather is detrimental to the flower due to its delicate nature and the only thing in the world which can hold the flower to the plant is the glowing and intense sun directly over-head in the heavens. The cotton plant is a sun plant, and can stand considerable drought during blooming. Rain is not desired at the blooming time in large or medium amounts.

A very uniform condition of temperature is suited for the best development of the cotton plant. This is most important during the flowering period of the plant. The air should be well warmed during this period of the plant's life. The temperature during this period of plant growth should be about 90 degrees. The temperature should be uniform, that is the departure from mean maxima and the mean minima during this period should not be very much. The limit is not known as yet but the less the difference the better it is for the optimum development of the plant.

Climate Best Suited for Fiber Production During its Formation.

During this period in the history of the cotton plant there must be an abundance of sunshine and a very small amount of moisture. The plant at this time has reached its full height and the largest share of its vitality must go toward developing seed and making fiber. If much rain occurs at this time in its life the results are deleterious. These results may be divided into three different or distinct kinds: First, the vegetative development of stems, leaves, and branches at the expense of the fruit. This causes the plant to stop blooming and the squares already formed will begin to drop off because of the too rapid growth of the branches to which they are attached. Second, the bolls absorb considerable moisture through the tissues of the plant and the surplus moisture present will cause decay to take place because the bolls are rendered unable to open, since it takes a large amount of warmth and sunlight to cause the bolls to open. If the bolls do not open under these conditions the bolls will be destroyed. Third, the fiber in the bolls already opened, when the rainy season begins, will be beaten out on the ground and will be lost or badly stained. It is therefore best for the cotton plant in this period of fiber production that the weather be dry and sunny without rains. There being no necessity for rains just sufficient moisture is required to meet the demands of the irrigation plant. In arid or semi-arid regions this can be supplied by irrigation where water is available. In other regions this moisture can be secured

by the roots, if they have been forced deep into the soil by seasonable weather conditions. At this time a tremendous need of the plant is uncloudy or clear weather.

Climate of the Picking Season.

The Fall months are spent in gathering the lent from the mature coton bolls. The greatest thing and the only thing that cotton planters desire during this time is that the frost be delayed as late as possible and also the rain should not be excessive during this period. Heavy rain-storms are not desired after the middle of September. The showers that come should be light, and not frequent. This dry condition of the atmosphere enables the pickers to gather the cotton in all its whiteness, unstained by dampness or dirt, as fast as bolls open.

Mell says, "It is a trite saying among the farmers that all flowers that open after the 25th of September will fail to produce mature bolls, unless the season is unusually prolonged in the winter months. This is based on the idea that frosts come early in November, and together with cool nights, preceding the frosts, cause the plant to lose a large part of its growing vitality and the young bolls will stop developing before the seed and fiber are mature."

Southern and Northern Limits of Cotton Production.

The Southern and Northern limits of successful cotton production should be determined for the sake of science and also to prevent useless expense to the cotton farmers, whom science endeavors to aid as well as the scores of other type of farmers. If this limit is determined then considerable energy of the nation would be saved which otherwise is uselessly wasted in experimenting by many farmers of the nations. Experimenting is not the work of individual farmers; theirs is a business enterprise and not an investigational enterprise. This work rightfully belongs to the agricultural investigator.

Milton Whitney 1 in discussing the northward limit of cotton gives the 40th parallel, which is equivalent to the isothermal line of 60 degrees. He says, "The limit of cotton production in the United States is the 37th north parallel"

Barbee 4 in treating cotton as to northward and southward distributions of cotton also gives the 40th north parallel as the limit. This would be equivalent to the isothermal line 60 degrees.

Burkett 2 in his book on cotton says, "The great cotton producing section of the United States lies a little below 37

degrees. This nearly coincides with a line drawn from Norfolk, Virginia, to Cairo, Illinois, and marks the northern limit of profitable cotton culture." In treating cotton distribution he dealt with cotton production in the United States and he failed to take into consideration the cotton production in Central Asia which extends to the 40th degree north parallel.

Halldane 7 gives the 37 degrees north parallel as the limit of cotton production. But he gives the 35 degrees north parallel as the limit of economic production in the United States. It appears that he did not take into consideration cotton production out of the United States and cannot be applied to the world as a whole. Barbee and Whitney's limitations are the most authoritative since they are the only ones dealing with the limitations from a world point of view. The others have simply dealt with the limitations in the United States.

The above authors except Whitney and Barbee refer only to parallels which mean almost nothing. The limitations should be given in isothermal lines and not parallels. The former are the most accurate. Isothermal line of 60 degrees is limit of cotton production according to the data available.

PLOUGHLESS TILLAGE.

D. Haldar, L. M. E. (B. H. U.) Assoc. Mem. American Society of Agricultural Engineers

There was a time when man had only his hands to work with, and from them he must have acquired his ideas for tools. Scratching with the finger nails undoubtedly impressed him with the need of something that would be effective on hard things, and so he devised such tools as the Khurpi, Phaora and numerous other cutting implements. Asia is considered to be the cradle of man and of human civilization. It was in Asia that man first acquired the intelligence to domesticate animals. With the process of domestication of cattle and the development of cutting tools, the first ploughing was introduced by man with a crude type of plough which we in India are still using. With the development of ploughing man gradually realized the threefold purpose of cultivation or tillage, namely, (1) the formation of tilth, (2) the conservation of moisture, and (3) the suppression of weeds. The Indian peasants, when they find that their country ploughs do not answer their purposes well, usually take recourse to hoeing with their Phaora. This is possible because they possess only small holdings. The hoeing operation is not at all economical and is being replaced by ploughs adapted from foreign designs. Thus slowly though steadily, the mouldboard plough is gaining ground

in India. At present we are experiencing great difficulties in making use of these ploughs on account of the lack of sufficient animal power.

In the Allahabad Agricultural Institute Farm we experimented with a system of cultivation without using any plough. Instead of using mouldboard ploughs we employed a bullock disc harrow. We could make a satisfactory seed-bed before the commencement of rains by means of this disc harrow whereas it would have been difficult to do the same with mouldboard ploughs. We could not detect any appreciable difference in yields on account of this new innovation. As regards cost we find the initial value of the disc harrow is at least five times the price of a mouldboard plough. The running cost is favourable for the disc harrow. If we compare tractor ploughing with tractor harrowing the former is much more expensive than the latter. The tractor ploughing costs not less than Re. 2-8 per acre, whereas tractor harrowing can be done for about Re. 1-8 per acre. The former covers only 5 acres a day and the latter almost double the acreage.

It is interesting to quote here from *The Implement and Machinery Review*, Nov. 1, 1929, how this sort of ploughless tillage has also drawn attention to the people of the New Hemisphere:—"The author, Mr. S. J. Sigfusson, of the Dominion Experimental Farm, Brandon, has been testing the validity of the claims made for so called 'ploughless tillage', and since 1922 this practice has been compared with the standard method of summer fallow. The latter consists of early June ploughing with such subsequent cultivation as may seem necessary, whereas 'ploughless tillage' involves cultivating the land in the autumn with a narrow tooth cultivator as the oat crop is removed, and with a wide tooth cultivator all the next season as often as necessary to keep weeds in check. The results for the past six years, a fairly substantial test, have shown that where land has been cultivated in the autumn and ploughed early next June, the average yield has been 41.2 bushels of wheat per acre. With 'Ploughless Tillage' *i. e.*, cultivated in the autumn and all the next season, but no ploughing, the yield has averaged 41.3 bushels."

Our experiments and those at Brandon clearly demonstrate that the plough can be dispensed with. We experimented also with another type of implement which is really a combination of a disc harrow and a disc plough. This implement is commonly known as a skimming plough. A 9-foot harrow-plough covered two acres per hour at a cost of Rs. 3-4 per hour and this includes the running cost, depreciation both for the tractor and the plough. So on the whole the ploughless tillage is a success. Under these circumstances we can easily ask our readers to think seriously whether we should not dispense with ploughs where possible.

FEEDING OF DAIRY CATTLE.

N. R. Joshi, I. D. D.

The foundation principles of successful selection of feeds and the feeding of dairy cattle depend upon the palatibility, variety, nutrition, ease of digestion and succulence of ration given.

Before we begin making rations for cows let us be reminded (*i*) that it does not pay to feed even good rations to scrub cows (*ii*) that it does pay to under feed good ration, (*iii*) that it does not pay to rations that are not well balanced, (*iv*) that nutrients are supplied more cheaply in good roughage that in concentrates (*v*) that the cows' digestive organs are well adapted to converting the nutrients of roughage into maintenance and mik.

Roughages: The rule is to feed roughages acording to the body weight or appetite of the cow.

On this basis it is always a safer practice to feed all the roughage that a cow will clean up. It goes without saying that the cows will eat more of good quality roughage than of poor quality. Every effort therefore should be made to get such quality as will persuade cows to eat a large quantity of roughages. If we have got to feed an inferior quality of roughage every effort should be made to make it more palatable. Coarse fodder must be well cut to reduce wastage. A little addition of "rab" will make such roughages more palatable. Variety may be offered to increase the consumption of roughages.

As a rule a cow will take 4 to 5 lbs. of silage or green kabri per 100 lbs. of live weight, and 1 lb. of dry fodder per 100 lbs. of live weight (1 lb. dry = 2½ lbs wet).

Concentrates: The most important functions of a grain mixture are (*i*) to supply the additional nutrients required that are not supplied in the roughages, (*ii*) to supply these nutrients in such proportions as will meet the requirements of a well-balanced ration. The feeding of concentrates is primarily based upon the production of milk and the quality of milk. Besides this the grain mixture should be palatable; it should supply variety of feeds; and it should be agreeabie to the cow. Avoid under feeding of *quantity* and avoid under feeding of *protein*.

A cow producing one lb. of milk testing 5% will require for production .06 lbs of digestible protein and .402 lbs. total digestible nutrients. While a buffalo producing one lb. of milk testing 7% butter fat requires .074 lbs digestible proteins and .50 lbs total digestible nutrients. Our present ration which consists of 2 parts mustard cakes, 1 part wheat bran, 1 part gram, and 1 part arahar husk gives per lb. .163 digestible protein and ·683 total digestible nutrients, which is sufficient to meet the demands for 2½ lbs of cows' milk and 2 lbs of buffalos' milk. All the animals

get beside this 2 lbs. of grain mixture for their maintenance which is to supplement all the nutrients that may have fallen short by insufficient feeding of roughages.

Minerals: On all the mineral elements found in the cows' body and used for making milk, it is thought the ones most likely to be deficient in the ration are calcium, phosphorus, sodium and chlorine. Observation tells us that with an abundance of mineral matter in the ration there is less sterility and other breeding troubles in the herd.

The chief source of calcium in farm-grown feeds is from the legumes. The chief source of phosphorus is in the grains and their bye-products. Salt supplies sodium and chlorine. Bone meal supplies calcium and phosphorus.

The following feeding and management is recommended to safeguard our cows from the effects of mineral deficiency :—

(*i*) Include a legume in the roughages as far as possible (*ii*) Balance the rations with suitable concentrates (*iii*) Provide salt. (*iv*) Provide bone meal (*v*) give cows at least 8 weeks rest. (*vi*) Allow them excerise, as much as they incline to take. Muscular activity increases the avidity of bone for mineral salts.

Green grass is known to influence mineral assimilation to a greater extent. From this it follows that the best time to build up any mineral depletion would be between August and November.

Water: Access to ample and clean water should be made possible thrice a day in winter and four times a day in summer, Usually a cow would require 8 to 12 gallons of water.

THE MARKETING OF VEGETABLES IN ALLAHABAD.

S. K. Roy, Assistant Manager.

Many different kinds of vegetables are grown in Allahabad and its neighbourhood. The soil and climate are very suitable for vegetable gardening except during the months of May and June when it is very HOT. On account of the above factor, and a good demand, vegetable gardening is a great attraction to those who have land near the city.

Most of the vegetables grown are brought to the wholesale market at Khurdabad, a place about four miles from our Institute. I think the main reason for choosing this place as a suitable place for a wholesale vegetable market must have been the fact that it is very near the East Indian Railway station and not very far from the City retail market. This provides transportation facilities as well as making it easy for the retail dealer to buy supplies.

The Municipality of the City rents out the market ground on a yearly contract for several thousand rupees and provides the person or persons who happen to have the contract with a clerk, whose duty it is to collect the market tax called 'Khonchi'. The market tax is charged on the quantity in which a certain vegetable or vegetables are brought to the market. As most of the vegetables come by bullock carts or by camels, or in baskets carried on the heads of the coolies, the Khonchi is fixed per bullock cart, per camel, or per basket, at two annas, one anna, and six pies respectively. When any vegetable comes in bags, it is charged at the rate of six pies per bag.

Before the vegetable is brought to the market, it has to pass by some Octroi officer or toll bar where the Octroi is charged according to the price at which each vegetable is sold in the market, and hence for such vegetables as potatoes, early cauliflowers, onions, garlic, early peas, etc., which sell dearer, the Octroi charges are more per maund or per 100 for these vegetables, than those which sell cheap in the market, such as turnips radishes, brinjal, etc. The Octroi officers are supposed to be kept constantly informed of the fluctuations of prices in the market, through their agents who are supposed to visit the market every day and note down the prices of each vegetable.

When the vegetable arrive in the market, it has to meet another friend who acts as the middleman between the growers and the purchaser and is called an 'Ahrati' in the vernacular. These men have a regular monopoly in the market and have a very strong hold both on the grower and the purchaser. Most of the growers who take their vegetables to the market have their middleman who helps them in selling their vegetables The grower in return has to pay him a certain amount per rupee, which varies with different vegetables. For vegetables like potatoes, sweet potatoes, etc., which are sold in large quantities, it is about six pies per rupee. For vegetables like tomatoes, cauliflower, turnips, etc., which are not sold in very large quantities, it is an anna per rupee. These men are known to the retail dealers as well as the vegetable merchants who come from Calcutta, Bombay, Karachi and other big cities. The middleman, therefore, helps the grower in selling his products. Sometimes these merchants from the outside would buy certain vegetables, especially those which can be shipped easily and to long distances, and would tell the middleman to pay the price for him. The grower who is anxious to get hard cash every day for his vegetables is paid by the middleman and the middleman realizes the amount from the merchant. Under the present existing conditions I think it very difficult to eliminate the middleman out of the scene.

The vegetables from the Institute have to pass through several hands before they reach the hands of the ultimate consumer. A part of it is bought by the City retail market sellers, a part by the merchants from the outside and a part by women who go from house to house selling them from baskets on their heads. Every morning as you go to this market you see a large crowd of these women marching to the market with their baskets on their heads, where they buy the vegetables at the wholesale rate and sell them at the retail rate, thus getting a fairly decent profit daily. Being women, they can easily get into Zenanas and other Indian homes and are able to sell a good deal every day. From the retail market a great deal of it has to pass through another hand before it reaches the consumer--namely the hands of servants who also act as middlemen between the retail sellers and their masters, getting as much as they can as their share in the bargain. We can thus see that each vegetable has to pass through so many hands before it reaches the ultimate consumer. In some cases, where the crop is sold as standing, it has to pass through another hand, namely the one who buys the standing crop.

From the above account we can easily conclude as to who is the loser in the bargain. The poor man who grows it with the sweat of his brow is the one who gets the least profit and the consumer who has to pay much more than what he would if the middlemen were eliminated.

FARM ENGINEERING NOTES.

MASON VAUGH, B. Sc., A. E.

The last year has seen one quite new development and considerable progress in all the phases of activity of the Agricultural Engineering Department. The new development has been the starting of a tractor driving, and power machinery short course for students who have finished the Intermediate Agricultural course. Two or three of the Provincial Agricultural Engineers have in the past taken in a few men from time to time for training in their workshops as tractor drivers but so far as we have been able to learn, this is the first course given by the regular teaching staff of an Agricultural College for collegiate students in India. Due to limitations of staff and facilities, we were able to take only a limited number so did not advertise the course widely. The time was set for the period of April 10th to June 10th, usually the hottest, most uncomfortable time of the year, when the college is closed, as then the staff could give time to it.

Seven men were admitted and to our surprise all of them stayed the full time. One purchased his own tractor before the course was finished, one accepted a position as salesman-demonstrator for tractors and farm machinery with a big firm, three are continuing their studies, and one other is looking after his own land. There have been many other applications for admission to the course if it is offered again and there is now a waiting list of nearly enough to fill another class. We had hoped to offer the course during October and November last but limitations of staff made it impossible. We now hope to offer it again in April and May 1930. This course seems to be meeting a real need and the demand for admission is growing. There is also constant pressure on us to extend it into, or add in addition, a further course to give full training in Agricultural Engineering. This course as given serves primarily those owning considerable tracts of land which they intend to cultivate themselves.

The course for Agricultural Mechanics has continued to grow in popularity. The number of boys finishing the three year's training creditably has continued satisfactory, only one boy from recent classes being in work other than that for which he was trained. One of the boys trained here was employed by a local engineering firm to set up and start as well as service McCormick-Deering tractors in June last. The only trouble he has had has arisen from the difficulty he faces when he starts a tractor for a new purchaser and has to refuse to accept a job as permanent driver for it. He gets Rs. 75 per month and travelling expenses. He can read and write simple Hindi but has had practically no schooling at all. Many M. A. graduates would be very happy to have as much but unfortunately are not willing to do this kind of work. Three other men have been placed as tractor and engine drivers this year, and one has just left to be motor driver and handy man for one of the district missionaries. The twenty boys now in training do most of the mechinical work required here at the Institute which ranges from making butter workers, repairing plows and carts, and making special pipe tees and bends to bending reinforcing iron for concrete work. They erect fencing, run our generating station and water supply, grind corn meal and flour, thresh, cut silage and even occasionally undertake to overhaul a motor car. One of the boys trained here some years ago has been taught to run the electric welder and has just started the training of other boys, two or three of whom are making good progress. Most of the carpenter work has yet to be done by hired carpenters but with the arrival of some new machinery which has just landed in Bombay, the boys will be able to take over more of this. It is coming to be recognised that our boys get a breadth of experience which they could not get in any

other school or commercial shop in this part of India and the demand for them is steadily growing.

The success of those already trained is leading to a steady increase in the applications for admission. Although we took in more new boys this year than ever before for this course, we were not able to admit all the qualified applicants. A few have been admitted to a sort of waiting list class who do practical work in the fields as farm hands. They have a chance there to show whether they are suitable candidates or not, and the better knowledge of agriculture they have is an additional asset to them when they become tractor drivers. One of the boys so admitted last year has elected to continue and complete his training in field work instead of coming into the apprentice mechanics course. We are hoping to gradually build up a course for field work training in this way.

This course is designed to develop the ability, to take responsiblity, and to carry on as much as to give technical training. We feel that these qualities are as important in the life of the Church as in daily business. Last year, the Sunday School class which these boys had attended for some years was changed so that they turn by turn taught themselves. This year, we have organised a complete Sunday School of three classes with one of the boys acting as superintendent and three others as teachers. A secretary-treasurer is elected for the year but the others change every week by a regular schedule. They are preparing a Christmas play to be given here and in the surrounding villages at Christmas time. They manage their own boarding arrangements cooperatively and, in connection with this, have a kitchen garden from which they get practically all their own vegetables. Much of the success of these features of their training is due to the good work of one of our former Institute students, Mr. A. D. Chand, who has been their house master since July.

EXTRACT FROM "YOUNG INDIA",

Dated the 28th November, 1929.

THE U. P. TOUR.

Ghandi Visits Institute.

From Kalakankar taking Partabgarh and other places on the way we reached Allahabad on the 15th instant, to face a crowded programme and, as in Delhi, a meeting of the Working Committee and the Joint Conference to consider the situation in the light of the events subsequent to the Delhi manifesto. But the strain in

Allahabad was less because the hand of Pandit Jawaharlal Nehru was visible in everything. When all is well arranged, times are kept and noises and rush avoided and the strain is but little felt.

The programme began with a visit to Dr. Sam Higginbottom's experimental Farm and Agricultural Institute. Gandhiji wanted to visit it not for collecting funds for *Daridranarayan* but as a farmer to learn what he could of Dr. Higginbottom's experiment. It was a packed one and a half-hour's programme. Gandhiji was hurried through the workshop, cattle-farm, sewage farm, soil reclamation area etc. Cross cattle breeding is being tried at the farm. Sewage is buried in shallow pits and used with good results on the very spot where it is buried. The liquid manure in the cattle shed is treated separately from the soild and is carried in a diluted form to a farm prepared for lucerne growing and the like. Gandhiji could not help noticing the contrast between this economical and scientific treatment of sewage and the woeful neglect of the Municipal Board which allowed thousands of rupees' worth of sewage to be annually wasted and the sacred waters of the Ganges and the Jamna to be polluted at the very spot where they meet and to view which tens of thousands of devotees travel long distances from all parts of India. We had a peep at the little children whom Mrs. Higginbottom is bringing up with a mother's care. Most of these are children born of lepers. This part of the visit finished with a five minutes' function at which the students presented a purse containing earnings from their own labour specially dedicated to *Daridranarayan* and a huge basketfull of the delicacies that mother earth had yielded at this farm. From this function Dr. and Mrs. Higginbottom took the party to the leper asylum near by conducted by them. They seemed to take special pride in this work of theirs and Gandhiji could not help envying Mrs. Higginbottom the spontaneous love that the little children bestowed upon their adoptive mother who with pardonable pride introduced the 'troupe' to Gandhiji as 'my children'! The Chawlmugra oil injections are regularly given to to the lepers with, it is said, 80 per cent. success complete or partial in recent cases and less success in advanced cases. But it is claimed that the ravaging progress of the fell disease is arrested even in advanced cases.

CROSS BREEDING EXPERIMENTS WITH INDIAN CATTLE AT THE HOSUR CATTLE FARM.

(EDITOR'S NOTE: The account herewith is a summarized statement of cattle breeding operations at the Hosur Farm given by the Director R. Littlewood to the Editor upon his visit on the 20th November, 1929, to the Hosur Farm.)

The report covers a period of ten years from 1919 to 1929. In 1919 the Madras Government approved the use of the Ayrshire bull on the Scindhe and Saniwal cows, in order to try and evolve a new breed of cow, which would breed regularly and produce more milk than the average country animal. First cross bull (F1) was used on F1 cow, F2 Bull on F2 cow and so on. In this way the breed retained half the imported blood and half the country blood. It was held that a breed of this description was required by the urban cow-keeper for milk supply.

Mr. Littlewood has compiled an exhaustive report of the breeding operations and observations, to be printed in a later issue. His general conclusions presented to the Cattle Committee of the Board of Agricultural Research, Pusa, December 9th, 1929, are as follows: For an experiment of this kind, a very large number of animals are required in order that the best animals of each generation can be selected for breeding. About 25% of those animals would be selected in the ordinary course of events and others discarded, but we have had a very limited number to work with and so could not afford to discard many animals, unless they were really bad.

There is a deterioration in size and milk yield in the F2 and F3 generations, although sufficient numbers of F3 cows are not avalable at present to judge their qualities.

Regarding the bulls, only one in five or six are fit for breeding. From a health point of view, the young stock give no more trouble than the Indian breeds provided that they are looked after well.

The Crossbred animal cannot stand up to the privations of this country and keep fit, like the native breeds of cattle.

Although the experiment has been underway for ten years, from the results, scarcity of data, it may be said that the experiment is really only just getting started.

Abstract of the resolutions passed by the Cattle Committee of the Imperial Board of Agricultural Research held at Pusa, India, Dec. 9th 1929.

1. This Board, as a result of the evidence placed before the meeting, support the view that to effect general improvement in the cattle of India attention should be concentrated on the indigenous breeds.

2. The interesting experiments in cross breeding with Imported Stock now being conducted at the Hosur Cattle Farm and at the Allahabad Agricultural Institute may usefully be carried out to their conclusion.

3. That in the opinion of this Board the custom of dedicating bulls as Brahamini Bulls without selection militates against the improvement of the cattle of the areas where it prevails; the Board accordingly suggests to local Governments that they adopt such measures as may be found feasible to make this custom contribute to the improvement of the cattle.

4. The possibilities of organizing the dairy industry on a co-operative basis by the Co-operative Departments of India was discussed. It was resolved that facilities should be provided for the education of Agricultural co-operative officers and for the training of expert dairy and cattle farm staff to manage co-operative dairy and cattle breeding. It was considered that the Allahabad Agricultural Institute and the Imperial Institute of Animal Husbandry and Dairying at Bangalore, at the present time offer the necessary facilities and are qualified to carry out this form of education.

5. The Board commends the work on animal nutrition now being carried out by the Imperial Physiological Chemist to the notice of officers of the Agriculture and Veterinary Departments in the Provinces with a view to their co-operating with him in the conducting as many experiments as possible and to enable the Physiological Chemist to undertake these outstation experiments, the Board recommends that the Field staff of the Nutrition Station be stregthened as necessity arises and be available for duty in all parts of India.

INSTITUTE NOTES.

Blind Asylum Work

G. P. VAUGH, A. B., B. S. HON. SUPERINTENDENT.

In the more than fifty years of its existence the Allahadad Blind Asylum has ministered to literally hundreds of poor and helpless people. During the most of that time it was housed in mud huts behind a mud wall. Three years ago the Asylum was moved from these unsanitary and inadequate buildings to a healthful spot not far from the Ganges River. Here there is room for almost unlimited expansion.

New well-ventilated modest but comfortable brick buildings were erected on the new site. A resident House Father was employed. Formerly the inmates passed their time in indolence and discontent but with the employment of a House Father and his competent wife some real constructive industrial work was begun. With the limited funds on hand the kind of work which could be done with the least expensive and smallest number of tools was taken up. This work consisted in the weaving by hand of small stools and the mending of cane-seated chairs for the men and the knitting of bead bags for the women.

Last March when Mr. Brooks left for America on furlough it became my privilege and responsibility to carry on the work of the Superintendency of the Asylum. In April and May daily prayers and Bible Classes were started for all the inmates, both Christians and non-Christians. The Christians were taught by the House Father and learned portions of The Sermon on the Mount. The Christians in turn taught the non-Christians such portions of the Bible as the 23rd Psalm etc.

A suggestion came from the United Provinces Christian Council that our present Asylum become a school for blind boys. There are in these provinces more than one hundred thousand blind people and many of these are children. There is a home and school for blind girls in Rajpur. With this purpose in mind steps have been taken recently to make the institution a school as well as a home for the blind. For this reason we have changed the name of the Institution to the School and Home for the Blind instead of the Blind Asylum.

In August a man was found with suitable qualifications for the heading up of such a school for boys, but he had no experience in work for the blind. He is now taking a year's training in the Calcutta School for the Blind and will come to definitely open up the school here next August.

Since July there has been a regular schedule of work for the inmates and all but two, who are physically unfit, are engaged in

regular industrial work. The making of rope of various fibers and grasses, stringing beds, recaning chairs, making of bamboo and cane stools keep the men and boys busy. Bead bags, knitted wash cloths and sweaters, and braided rag rugs keep the women employed. In one month's time one woman was able to earn more than half her expenses. The work is going nicely and discontent is gradually disappearing.

The opening up of the industrial work has meant an increased expenditure with not for the present a large proportionate income. The first rope sold for much less than market price. The second attempt sold for market price and with only about half as much waste in raw material. Several other paying industries could be taken up to advantage if there were only funds for investment in equipment.

The greatest need at present, however, is for more buildings. The present Asylum can house only fifty inmates. Last March at the close of our year we were full. During the year a number of applicants were turned away for lack of room. The present buildings though suitable for the home are not at all adapted for school purposes. A dormitory and class room building for the school and a bungalow for the teacher are very necessary.

The Christmas celebration has just been held in the institution. An interesting feature of the short religious program of song, prayer, and Bible reading was the singing of a Christmas hymn to the accompaniment of a five gallon kerosene oil tin used as a drum. Our blind people are very fond of music and are willing to use anything which will lend itself to rhythm. As soon as funds are available a number of instruments will be bought and classes in both vocal and instrumental music will be begun. Another most interesting part of celebration was a series of contests consisting of the eating of a guava hung from a string, a cripples' race, the breaking of a water jar, a tug of war, and a contest in speed in putting on stitches on knitting needles. After the program and the contests prizes were given to the winners. Two prizes in money were given to the couple and the single person having the cleanest room.

For Christmas gifts each child in the place received a toy and some clothing; each woman a blouse and each man a knitted scarf. After each had properly felt and admired his gift it was either put on immeditely or tucked away as something precious to be guarded carefully. The crowning event was the big Christmas dinner.

The Farm Dispensary.

By D. N. Forman, M. D. Acting Physician in Charge
Allahabad Agricultural Institute.

The medical work carried on, year in and year out, in this little centre, has become largely an integral part of the Institute life and activities. Missionaries, members of the staff, students, overseers, employees, field-hands and simple villagers come, in democratic array, to avail themselves of the service rendered there. The doors are open daily from 8 to 11 in the morning, and although the numbers cared for are not large—about 6,000 in the course of a year—there is quite a variety of pathology observed in this rural clinic.

First, of course, comes that scourge of all the country districts of India—Malaria. It is hard for those living in the Northern States of America to realize what extensive havoc this one disease causes amongst the peasants of this land—not so much in mortality as in marred health and lowered efficiency.

The clinical picture of an advanced chronic malarial infection once seen is not soon forgotten. Paleness, thinness and a protruberant abdomen, produced by the presence of greatly enlarged spleen, are its main features: and usually the patient's chief complaint is *susti*, that common Indian word meaning 'loss of pep.'

Thousands of grains of quinine are passed over the dispensing table of the Farm Dispensary, in an attempt to eradicate such infections: and hundreds of bottles of iron and arsenic solution follow, in the effort to build-up both the hemoglobin alnd the morale of the sufferers. Many of them pass out not direct y as a result of the malaria, but from some superimposed infection' such as pneumonia, which finds these debilitated subjects to be fertile soil.

The past year has witnessed, too, the same rather large number of patients suffering from intestinal parasitic infestations—cheif amongst which are round worm and Hook worm. If it were not for the friendly sun, which for nine months out of the year blazes down on all the millions of isolated excrementory deposits scattered over fields and gardens, destroying the ova of the worms before they have a chance to develop into larvae, the inhabitants of our villages would be much more heavily infested. As it is, most of the cases of heavy infestation come from neighbouring villages, where sullage from the city is used to irrigate and fertilize the plots of sugar-cane and vegetables.

Tuberculosis, although on the ascendency—thanks to improved facilities of transportation between the city and the village—is relatively not frequently seen in the dispensary.

Far more common is that harassing condition, chronic bronchitis, which makes of an individual a life-long invalid, but seldom kills. The inspiration of a dust and smoke-laden atmosphere, coupled with the breathing of air which has already been thoroughly utilized by the other occupants of a crowded sleeping room, are undoubtedly contributing causes. Shortness-of-breath and cough are the symptoms which keep the sufferer coming to the dispensary for temporary relief, or in the hope that he will ultimately be cured.

It is interesting to note that injection material, made by filtering a fairly large amount of the patient's sputum through a Chamberland filter candle, and administered subcutaneously, over a period of a week, has in about 25 per cent of the cases resulted in varying degrees of definite improvement. Not a few of the victims of chronic bronchitis with asthma date the onset of their trouble from the great influenza epidemic of 1918.

Every week or so a leper wanders into the dispensary, in the hope that an injection or a few doses of some wonderful medicine well rid him of his complaint. His face falls, as a rule, when he is told that he may have the choice of going into the asylum, or of coming to the dispenaary for his weekly injection, over a period of a-year-and-a-half or two years. To be institutionalized is abhorrent te him, and to come a distance of 15 to 20 miles regularly ouce a week is 'impossible.' However, there are a few—very few—hardy souls. who go through the long tedious course and are cured.

It is hard to gauge the relative incidence of syphilis in the rural areas of India. Suffice to say, that, except for a few foci in certain scattered villages, and except where there has been unusually frequent contact with the city, it is our opinion based largely on experience in the Farm Dispensary, that syphilis is not a very prevalent disease. Two to three per cent would be our estimate of its incidence amongst the peasants of this region. It is a satisfaction to be able to report that, thanks to the kindness of a semi-eleamosinary manufacturing firm in merica neo-salvarsan, the most effective remedy in the disease, is available for use in this dispensary, indeed, it is one of very few clinics in the country where a syphilitic patient can get the benefit of regular intravenous injections of '606', or rather '914', by paying the usual two or three annas (5 to 8 cents) asked of all patients, who come for treatment. Practically all of them have the diagnosis and management of treatment checked up by the 'Kahn Test', which is a comparatively simple but very valuable serological test admirably suited to the needs of those of us who work in the tropics.

Perhaps the only real contribution which the staff of the dispensary has been able to make to the general body of knowledge

concerning the diseases of this section has been the emphasis which has been laid on the prevalence of filariasis. This condition is the cause of the well-known, grossly evident 'elephantiasis'. Repeated examinations of the "night bloods" of hundreds of patients, have made us realize that the infestation is frequently present without there being any external evidences suggestive of its presence. Repeated attacks of fever ranging from one day to three months in duration, head-ache, general aches and pains, and a score of other symptoms are, we believe, caused by the presence of the millons of little filarial larvae in the blood-stream of the unfortunate patient. While the adult worms (one to one-and-a-half inches in length) are more directly responsible for producing the local swellings, particularly of the legs, which for centuries have been designated as 'elaphantiasis'.

The disease is transmitted by the mosquito, and so far no specific has been discovered which will rid the patient of the infestation. Intravenous injections of various antimony compounds seem, however, to give some relief to those suffering from systemic symptoms.

These then are *some* of the major problems which confront us—at least in adult patients. It seems hardly necessary to mention that constant stream of mal-nourished and sickly infants who pass through the dispensary in the course of a year. One feels helpless in his attempts to cope with the problem, or even with some of the individual lines and conditions which go to make up the problem. Our great hope is that the "Mother Institution" will through her generation of selfless, well trained students, and telling demonstrations help to gradually raise the level of life in these villeges, and that with the raising of that level will come the more intelligent raising of children in the village homes of India.

The Children's Homes.

Mrs. Sam Higginbottom.

The number of inmates in Untainted Homes has increased to 102 although some of our boys have gone to work and one girl was married. Three big girls are getting Bible and Teachers' Training at Muttra and five boys are working as apprentices for the farm.

Seven girls are in the fourth and fifth standards at the South Road Girls' School and fourteen boys are in the middle classes at the Jumna Boys' School. We are so happy when our boys and girls are eager and capable for advanced study.

Four boys, upon becoming six years of age, in the Baby's Home were suddenly told they must learn to become manly and were sent to the Boys' Home for their first lessons. From the Boys' Home nine have graduated into the Girl's Home. In a few days they acquired the manners of school children and took Kindergarten quite seriously.

All the 23 leper children are showing marked improvement. This week the Doctor's staff will be making the quarterly examination on them. The last word is that five children have no signs of active leprosy on them. In another three months, they can go to the homes for Untainted Children.

At present great excitement pervades the air in all four Homes – Christmas is coming ! Memsahib had to tell them that there are dolls, toys, and clothing in the storeroom which has come from many places in the world and will reach the tree on Dec 23rd.

The Women's Corner.

You all know that the farmer never succeeds very well without the farmer's wife, so we wives know that we are needed at the Agricultural Institute and we are glad when our "Farmers" ask us to take a corner in the "Farmer".

We miss Dr. Mabell Hayes at the farm and at the farm dispensary and the students are also missing her, while she is on furlough. Dr. Douglas Forman and his assistants, however, inspire confidence and are very kind. But next year, we are counting on more medical work being done for the women in the neighborhood with Dr. Hayes back and Mrs. Hansen. Someone exclaimed the other day when they heard that Mrs. Hansen is a nurse : "The Agricultural Institute is most awfully fortunate in getting just the kind of wives that it needs". We think Mr. Hansen did the best possible when he got a wife trained as a nurse. She is getting the language and some idea of what India requires of a nurse.

Mrs. Vaugh is bringing the Blind Asylum into a happy, orderly institution. In addition she is helping many of the women in the neighboring villages, next to the farm.

Mrs. Hatch efficiently supervises the mailing list and sees that our letters and cards get started rightly addressed. In addition, Mrs. Hatch has done good work in getting the wives of our staff together twice a week to play badminton.

Mrs. Pugh, Mrs. Roy, Mrs. Dutt and Mrs. Joshi are getting acquainted and eager to help wherever they may. Next year, we hope they will be able to do lots of work in the villages under Dr. Hayes' guidance.

Mrs. Higginbittom is happy mothering the community, teaching a Bible class of Institute students, which give her a chance to know some of the students well. She also continues work in the Leper Asylum and the Children's Homes.

Students' Notes.

ATHLETICS.—The Institute football and hockey teams entered the local league tournaments. We were leading in the first round of the tournament when two of our good players were disabled, which had a decided effect on the result. The hockey tournament was even less successful. But with more practice and coaching we hope to have good teams.

The American game of basketball has been taken up with keen interest by students and staff. Tennis suffers through lack of funds and it is conjectured that the construction of two concrete courts would do much to improve the premier game of the world.—A. CHATTERJI.

LITERARY SOCIETY AND DEBATING.—There has been good interest in the Union Literary Society during the year. Each student is daily becoming more proficient in declamation and debating. This year Messrs. M. A. Mamma and D. J. Gandhy were winners in the declamation contest; while Messrs. Herbans Singh and Kedar Nath were the winners in the prize debate.—D. J. GANDHY.

A LETTER.—(*extract*)

Dear Principal, The training that I got under your kind supervision and care has not only made me a popular officer of the department but has also enabled me to raise myself up to the mark of an expert manager. People who appointed me are satisfied in having done so. They are not only pleased with my work but also are praising the College and the staff of the Institution I came from.

How is the Lit. Society running? I wish I could go there and again take a part in the competitions. What a help this sort of activity gives to young people like us is beyond the power to explain.

EXAMINATION RESULTS.

Agricultural Diploma Class of 1929.

Passed.

1. Amar Nath Kohli, Agricultural College, Cawnpore.—Studying in the IIIrd year.

2. Benoy Bhushan Dutta, C/o H. B. Dutta, Esq., Bogma Road, Barisal, (Bengal.)—Proceeded to England for further studies.

3. Brahma Kishore Kapur, C/o B. Brij Kishore, Pleader, Ashraf Tola, Hardoi, (Oudh).

4. Jagdish Prasad Srivastava, Agricultural College, Cawnpore.—Studying in the IIIrd year.

5. Jung Bahadur, Agricultural College, Cawnpore.—Studying in the IIIrd year.

6. Kailash Chandra Varma, C/o Mr. Sham Lal, M. L. A., Retired Deputy Collector, Cawnpore.—Helping his uncle in Cawnpore.

7. Kamla Prasad Singh, C/o Th. Rameshwar Prasad Singh, V. Chaukhara, P. O. Dumariaganj, Dist. Basti, U. P.—Allahabad Agr. Institute for special course.

8. Ch. Khazan Singh, Agricultural College, Cawnpore.—IIIrd year.

9. Krishna Murari Gupta, C/o Braj Mohan Vyas, Esq., Executive Officer, Municipal Board, Allahabad.

10. Kunwar Vishambhar Nath Saxena, C/o Rai Sahib B. Kanh Kunwan, Hon'y. Magistrate, Director, Co-operative Bank and Chairman Municipal Board, Orai, Dist. Jalaun, U. P.—Doing his own zamindari work and improving his land. Recently came to the Institute for the tractor course.

11. Paul Singhanayagayam, Allahabad Agricultural Institute.—1st Year Dairy.

12. Rajendra Lal Asthana, Agricultural College, Cawnpore.—IIIrd Year Agr.

13. Ram Krishen Lekhenpal, Agricultural College, Cawnpore.—IIIrd Year Agr.

14. Ram Rup Singh, C/o Sheo Narain, Esq., Vill. Ranipur, P. O. Shahpur, Dist. Allahabad.

15. Sri Narain Tandon, C/o Messrs. Volkart Bros., Calcutta.—Tractor Demonstrator.

16. Sri Ram Verma, C/o B. Jagmohan Prashad, Suptd., Board of Revenue, 21 New Katra, Allahabad.

17. Sudhamoy Chatterjee, C/o Haripada Chatterjee, Esq., Overseer, B. N. Ry. (Eng. Dept.), Kharagpur, Bengal.

18. Zacevous Minas Alexander, Agricultural Institute.—Dairy Supervisor.

Anwar Dial Chand, Agricultural Institute.—In charge of the Apprentice Boys.

Failed.

1. Jai Gopal Puri, C/o L. Manohar Lal Puri, Ghartal, Dist. Sialkot.
2. Ghulam Masih Bhatty, C/o Ch. Shama Bhatiya, Chak No. 148/9L, Ransonabad P. O., Via Harrapa Road, Dist. Montgomery, Punjab.
3. Lal Din, C/o Mr. Dayala, Village Wahga, P. O. Singh, Dist. Sialkot, Punjab.—Kila Soubha.
4. Profulla Kumar Sen, C/o Babu Bhupendra Nath Sen, Nurnagore P. O., Khulna District, Bengal.—Katunia.
5. Promoderanjan Roy, C/o Babu Nagendra Kumar Roy, P. O. Banigram, Chittagong.—Zeminder.
6. Robindra Nath Sanyal, C/o Kisore Mohan Banerjee, Esq., 70, Sonarpura, Benares City.
7. Santosh Kumar Sen, C/o Babu Sailendra Nath Sen, I Lane, P. O. Cossipore, Calcutta.— Khelat Babu.

Special

Joseph Ibrahim, Rostam Farm, Baghdad, Iraq.—Took the House Examination and received our certificate. He is working in Iraq as an Asst. Plant Breeder.

Indian Dairy Diploma Examination, 1929.

1. Chandra Mohan Dass.
2. Shri Gopal.
3. Baikunth Chandar Syal.
4. Kedar Nath Gholati.
5. P. R. Gokhale.
6. Harbans Singh.
7. C. V. Mathew.
8. P. K. Jacob.
9. Ram Sahai Sharman.
10. Gajindra Singh.
11. Kirpal Singh Madan, B. A.
12. H. T. Gogate.
13. Rama Pati Ghosh. (Failed.)
14. Surjan Singh Deol. (Failed.)
15. Hazura Singh. (Failed.)

IN MEMORIAM.

We regret to announce the death of Percy Wray on Nov. 2nd, 1929. Percy was one of the first graduates of the Institute. He was employed in a responsible position on the State Farm, Gwalior.

THE ALLAHABAD FARMER

A quarterly magazine devoted to the extension of Agricultural knowledge in India and the work of the Allahabad Agricultural Institute.

RATES OF SUBSCRIPTION.

FOREIGN, yearly, four issues, 4 shillings or 1 dollar. International money order.

INLAND, yearly, four issues, Rs. 2-0-0.

SINGLE COPY, 8 annas.

AGRICULTURAL INSTITUTE STUDENTS, yearly, Rs. 1-0-0.

Applications for specimen copies must always accompany four annas worth postal stamps.

RATES OF ADVERTISING.

Advertising will be accepted for insertion at the yearly rates given below :

Full page, Rs. 15-0-0. Half page, Rs. 10-0-0. Quarter page, Rs. 5-0-0.

Advertisements will be published if payment be made in advance by the advertiser, and one copy of the magazine will be supplied to him free.

CONTRIBUTIONS.

This magazine is devoted to the extension of Agricultural knowledge in India. Contributions, either technical or general, are solicited from anyone having the improvement of the Indian Peasant at heart. All such contributions should be written legibly on one side of the paper only. Rejected articles will not be returned, unless accompanied with return postage.

Contributors are requested to send in their articles two weeks previous to the prospective date of publication. The magazine will be published in the months of January, March, July, and October, during the first week.

Contributors will receive one copy of the FARMER in which their article appears.

THE ALLAHABAD FARMER

A quarterly magazine devoted to the extension of Agricultural knowledge in India and published by the Allahabad Agricultural Institute.

CONTENTS :

Vol. 4. April, 1930. No. 2.

THE ALLAHABAD FARMER

A quarterly magazine devoted to the extension of Agricultural knowledge in India and published by the Allahabad Agricultural Institute.

CONTENTS :

THE
ALLAHABAD FARMER

VOL. IV.] APRIL, 1930 [No. 2.

ECONOMIC FREEDOM FOR THE DEPRESSED CLASSES.

W. H. WISER, SECRETARY, RURAL SERVICE AND RESEARCH BUREAU.

The work of the reformer is not complete when he has removed religious disabilities from the depressed classes and made it possible for them to enter the same temple along with their higher caste co-religionists ; or when he has removed some social disabilities and made it possible for the depressed classes to smoke or eat with higher caste co-religionists. There still remains one link of the religio-socio-economic chain which binds the depressed classes in its vice-like grip.

A short time ago, a Chamar—leather worker—who had earned for himself a reputation as a road contractor and builder, felt that with his increased earnings he should improve his standard of living. His sons were attending High School and he purchased some chairs for his reception room. His trade had sprung up in a large sized town, while he lived in his ancestral village. When the Thakur (high-caste) landord of the village learned that one of his low caste tenants was entertaining his guests by seating them on chairs, he sent for him and asked what he meant by having chairs in his house. Didn't he know that this was a privilege reserved for men of higher social standing ? The Chamar replied that he had attained to that higher standing because of his large business as a contractor. The Thakur then informed him that no matter what his earnings might be he must remember that he was first of all a Chamar and as such must keep his proper place in the existing order. The Chamar replied that he knew of no law forbidding his having chairs and he was going to have them. The Thakur then said, "Very well, you may then leave your ancestral home."

The Chamar began his search for a new residence and decided to purchase some land over which he would have sole control and not be subject to the tyranny of a landlord such as his. The Thakur's scouts informed him of the Chamar's efforts to purchase land, and were able for some time to prevent him from getting

land. Money won through and the Chamar got his land. He shifted from his ancestral home and built a new one where he could live and develop as he pleased. Moreover, he has been able to help others of his outcaste brothers who wanted social freedom.

When the U. P. Land Tenancy Act was revised several years ago so that landlords who wished to cultivate land in their own rights were granted the privilege of acquiring land from some of their tenants, a Marwari (trader) landlord asked a District Magistrate for permission to acquire a section of land. The Magistrate had his doubts about the Marwari's intention of cultivating the land himself and gave him a simple examination regarding agricultural methods. The Marwari made a poor showing. The Magistrate promised to look into the circumstances. When he went to the village, he found that the land was being held by a group of Chamars who being unusually fearless and aggressive, were moving ahead a little too rapidly to suit the high-caste landlord. His remedy was to seize their land in an entirely legal manner, but the Magistrate saw through his game and prevented the interference.

The depressed classes living in the city who are no longer dependent on the hard and fast religio-socio-economic order of which they were a part in the village, have an opportunity of moving ahead. Some of the thrifty Chamars, for example, who are employed in city factories have through their earnings made themselves powerful rivals of their high-caste neighbours, and have no desire to return to their ancestral villages.

They may in turn tyrannise over those dependent upon them, but they have become what they are because of the economic freedom they enjoy in the city.

The member of the depressed classes in the village who has little land of his own and is dependent economically on the will of his high-caste patrons or employers, has caused very little disturbance to the existing order, and will cause very little in the future if he is content to remain an economic slave to that order. The Chamar who became a successful contractor through helping to build up a growing town would never have reached his position of economic independence which in turn made it possible to make social and religious demands, if he had been content to depend on the crumbs that fell from his ancestral master's table.

About two years ago, a Chamar was making ready to go out to the fields to glean. In this way he collected his wages for helping to make irrigation beds earlier in the season. A Brahman, who considered himself the Chamar's particular master, came up to his house and demanded that he work for him that day as he wanted to get his crops in at once. The Chamar explained his position, that he would lose his opportunity of realizing his wages

for work done months before. The Brahman pressed his demands. The Chamar refused to be moved, whereupon the Brahman picked up a stone and threw it at him causing a deep cut in the face. The Chamar then came to me with his face streaming with blood. The village Panchayat said the Brahman should not have thrown the stone and reasoned with the Chamar that the Brahman was naturally a man of unsettled disposition and that he should forgive him his display of temper.

In many places the heads of the present order have found it necessary to supplement their traditional earnings by engaging in agriculture. And Brahmans who according to the old order were expected to devote themselves to priestly duties are found handling the plough, a duty formerly assigned to the Sudra. They have taken advantage of the economic freedom which is theirs by might. But in many instances these very same men are unwilling to let sweepers supplement their precarious living by engaging in agriculture. The Brahmans are unwilling to let sweepers draw water from wells in order to irrigate fields, without the help of which it is impossible to cultivate. They are prevented from advancing themselves through an extended use of the one raw material that exists for all in the village, namely, the soil. If the Brahman feels that the provision of the old system is not adequate economically for himself, should he not be willing to consider the position of depressed classes who cannot exercise the same freedom of choice?

A question that a member of the depressed classes may fairly ask himself is this, "Is there anyone in the village who will help me improve my economic status?" There are those who are willing to help increase one's indebtedness for unproductive things such as weddings and feasts, but such loans tend to increase one's dependence rather than independence. Also, one can generally get enough of a loan to help him out of a tight pinch. But this all helps to maintain the "status quo." The old religio-socio-economic order is a marvellous structure for maintaining "status quo," and for guaranteeing that as long as each is willing to do the piece of work assigned to him, he and his family will not be permitted to starve. These families which are the product of a system which provides for an order complete in every detail, help to swell the numbers shown by economists as being poverty stricken. It is no place for the member of the depressed classes who desires to improve himself. Yet if he were to accuse the higher-caste men of not giving him enough to keep body and soul together, he would be reminded of a series of petty gifts which in the eyes of the donor are more than adequate for his needs.

Employers in the cities are learning that economic freedom pays—and that an employer should not pay as little as possible, a

piece of gur, a few sweets, several chippatis, a handful of grain from time to time—but as high as business will allow. "The old idea was to give the wage-earners just enough to keep soul and body together. But wise men now understand that with our mass production we cannot go on producing without millions of consumers, and that we cannot get millions of consumers without paying the great body of the common people wages high enough so that they can consume; so that the new prescription for prosperity is not to keep wages down to the lowest level, but to lift them to the highest possible level."*

Are village leaders going to persist in maintaining "status quo" which borders on the poverty level of existence, and force those who want to progress, out into opportunities offered by the economic freedom of the cities? Or are they going to read the signs of the times and help their less favoured caste brethren to develop to the maximum of their economic ability? Where there is economic freedom, there is competition and the best man wins. But the present caste leader, with his superior traditions and advanced economic status, should have little difficulty in retaining his position of leadership The great difference is that the privileges of birth give way to merit, and one's leadership no longer depends on restricting the economic freedom of others less favoured by birth. Are the leaders of the present religio-socio-economic order thus prepared to throw themselves into the crucible of fate, or will they wait for the masses, under cover of the growing industrial order, to wrest from them that which they insist upon retaining by right of birth?

SHEEP BREEDING EXPERIMENTS IN THE UNITED PROVINCES.

CAPTAIN S. G. M. HICKEY, M. R. C. U. S., I. V. S.

Veterinary Adviser to Goverment, United Provinces.

The object of sheep-breeding in India is to produce a commercial commodity and to produce it in such a manner and of such quality and in such quantity that it will allow a reasonable profit over the expenses incurred in producing it. The commercial commodities produced by sheep are wool, mutton, and progeny.

In attempting to improve the breed of domesticated animals, patient work is necessary to see the result of one's endeavours. With sheep-breeding, owing to short period of utero gestation, breeding may be improved in a short period if carried out with intelligence and on scientific lines. In fact there is no animal

* "The Importance of the Ordinary Man" by Harry Emerson Fosdick in the "Christian Century Pulpit" February 1930.

that seems to alter so quickly as sheep, provided it is given the right management.

In some countries mutton is the chief factor that is thought of, in others, wool only, but in most countries, as in India, the sheep is intended as a dual-purpose animal, that is, it is bred to produce both wool and mutton; in India at present both are of exceedingly poor quality in comparison with sheep of other countries. It has been the endeavours of the Civil Veterinary department of this province to improve their quality and quantity by maintaining experimental flocks of the best Indian ewes and crossing them with imported rams; with the main object of working on the lines of grading, so as to produce at the earliest possible stage, a profitable wool-bearing animal and to breed out all semblances of the Indian hairy sheep, which is without form and devoid of any qualities, retaining apart from its being the sheep of the country and the foundation upon which to build the future enterprises, little further value.

Opinion differs as to the means of best gaining this end, but the present tendency is to rely on Merino rams as the first and the only cross; as the past history and individual experiment seem to point out the suitability of the Australian Merino rams for mating with the Indian ewes, preferably those of the strong and medium-wooled variety from the Reverina district, where that climate is not altogether unlike that of some parts in India.

In the Merino we have the oldest-established breed known—a breed brought to a pitch of excellency in a wool-bearing animal unattained by any other breed of sheep in the world.

Probably few people are aware that the first sheep that were imported into Australia were from India and the Cape. It is only a little over a century now that sheep were unknown in the Colony; and the first sheep-breeding experiments ever made there were crossing the Indian ewes with Cape rams. These breeds were selected for the reasons that the climate of those places was considered to be less dissimilar to that of Australia than any other. The first importation of Indiau sheep was said to be of such an inferior type as to give one the idea that they were incapable of any improvement. They were described as "long-legged, flat-sided, razor-backed beasts, with a covering more like hair than wool." And this description applies fairly well to the present Indian breeds.

Yet, this was the foundation on which the greatest sheep-breeding industry of the world was built. But there, of course, it was brought about by the natural facilities of climate and pasture, assisted by the patience, perseverence, and good judgement of the colonists and pastoralists. In short, the Australian sheep may be said to have been evolved from the Indian, by

judicious selection and crossing with other good strains, principally the Merino.

The records of the early sheep-breeding operations in this country are somewhat melancholy reading, and at first appeared to be by no means encouraging to those who would give improved sheep-breeding a trial. Watt, in his "Dictionary of Economic Produce," gives a somewhat concise history of the early endeavours to improve the indigenous wool. We are informed that, since 1825, spasmodic attempts were made from time to time to better the breeds of Indian sheep but that, generally speaking, these efforts appeared to have met with very little success, although even now it is interesting to occasionally meet with a flock in which the fleece is somewhat better than usual. This usually reveals the fact of crossing at some time previously with some imported strains; and there are localities where the superiority of the sheep can be distinctly traced to the introduction of imported stock. Generally speaking, however, we are told these experiments ended in failure.

An accurate enquiry into the causes of this failure, entailing a study of the whole history of the various operations, appears necessary to form a correct idea of what amount of success might be expected for the future. Watt further remarks that on reviewing the historieal aspects of the attempts at improvement that have been made in the past, one cannot help but be struck with the absence of any sound scientific or systematic basis on which the experiments were conducted, and emphasizes the want of continuity in the operations. He points out that it is obviously absurd to expect to evolve a new and improved strain of sheep in two or three years.

There appears to have been a total disregard of scientific facts in the choice of localities and the methods of breeding, resulting generally in the ultimate return of the features of the progeny to those of the prepotent indigenous parents. It seems only to have been thought sufficient to import rams of a famous breed, without any regard to dissimilarity of the pasturage, water, climate, and other conditions in India to that of their natural home; and little or no attention seems to have been paid to the most important point of all, *viz.*, the selection and the suitability of the indigenous ewes and the intelligent mating of the progeny.

The pastoral industry of this country varies according to the different conditions, climate and otherwise, under which the sheep are reared. Thus, hot, dry areas such as Bikanir, Bundelkhand, and Muttra seem to favour wool-growing and the animals usually breed and thrive well; in certain tracts of the Himalayas, hardy breeds of sheep are found; whereas other parts, notably damp and steamy localities, only appear able to support small weakly

animals, with fleece like hair. It is a generally acknowledged fact amongst wool-growers that to be successful in their undertaking, the first condition is the suitability of sheep to the climate, temperature, pasture, and of the locality where it is intended to rear them. If moderate treatment is meted out to them, sheep, above all other animals, under favourable conditions, are the most susceptible to improvement and give the quickest results

It is obvious that any efforts to be made in the direction of improving the wool-producing capacity of sheep and developing the industry must be carried out in a scientific and business-like way and continuity of the policy must be assured. We felt convinced that the first operation should be entirely experimental and devoted to a survey of the various tracts where sheep are at present reared, with a view to ascertaining where they will thrive well and produce the best wool, mutton or both.

Officers of the department were, from time to time, specially deputed to the following districts in order to make a thorough survey and find out the tract best suited for the sheep: Dehra Dun, Naini Tal, Almora, Gharwal, Saharanpore, Meerut, Bulandshaher, Aligarh, Bijnore, Badaun, Etah, Etawah, Muttra, Agra, Mirzapur, Gorakhpur, Moradadad, Banda, Orai and Jhansi.

Thus we have collected some very useful information as to the conditions of sheep-breeding in these tracts.

The Officers thus deputed were of opinion that Muttra, Moradabad, Upper Garhwal, Bundelkhand, and Mirzapur are the tracts best suited for the sheep-breeding industry. Already a large number of sheep are raided there and if they can be improved on scientific lines they would prove a great wealth to the country.

In 1912 the Civil Veterinary department of the United Provinces decided to give the subject of sheep-breeding its serious attention and in order to attain the soundest information and help in the matter, several sheep-breeders and wool experts were consulted, and the experiments that were carried out in other countries were lfully studied. It had already been realized that we had very ittle real knowledge of the Indian sheep and unfortunately it is difficult to obtain much help from the native sheperds, who are notoriously a most obstinate and ignorant class. They give practically no intelligent attention to selection and mating of their flocks or to the management of their animals and cannot be induced to depart from the time-honoured traditions of their forefathers in these matters, however unsuitable they might be.

Experimental flocks of selected Indian ewes were located at Bahraich, Muttra, Allahabad, Atarra (Banda), Mirzapur, Lucknow, Moradabad, Kheri, Aligarh, Garhwal and Naini Tal.

The breeding experiments carried out were :—

(a) Merino ram and desi ewes :

1. Merino ram mated with desi ewes.
2. Ditto with half-bred desi ewes.
3. Ditto with 3-4 bred Merino ewes.
4. Ditto with 7-8 Ditto

(b) Merino ram and Bikanir ewes :

1. Merino ram mated with Bikanir ewes.
2. Ditto with 1-2 bred Bikanir ewes.
3. Ditto with 3-4 bred Merino ewes.
4. Ditto with 7-8 Ditto
5. 7-8 Ditto with 7-8 Ditto

(c) Romney Marsh ram and desi ewes :

1. Romney Marsh ram mated with desi ewes.
2. Ditto with 1-2 bred desi ewes.
3. Ditto with 3-4 bred Romney.
4. Romney Marsh ram mated with 7-8 bred Romney Marsh ewes.

(d) 1. 1-2 bred ram mated with 1-2 bred ewes :
2. 1-2 and 3-4 bred mated with 1-2 bred ewes.
3. Pure Merino mated with pure Merino.

Strict precautions were taken to avoid in breeding and the selection and gradation were conducted very carefully. The result of the first cross, *i. e.*, Merino mated with half country ewes, has been very striking. The half-bred began to exhibit fleece which was distinctly wooled and not hair, as it is with the Indian sheep. There is in most cases increased length of staple, a greater firmness and softness ; more remarkable than anything however is the increased "swint ;" this is merely natural lanoline which is practically non-existent in the Indian sheep and its absence is what gives the fleece of that animal such a dry hard character.

The value of the wool of the first cross is four times greater than the country animal, inasmuch as its quality is so much finer as well as its weight per fleece.

Still, it contained some bad points ; it is often kempy and rather short in staple and often more brittle than it should be.

The shape of the cross bred, however, began to differ from the country ancestor, the head usually assuming the shape of its male parent, the feature so prominent in the country sheep, *viz.*

the Roman nose and the loop ears began to disappear. In the best specimens, the half-bred is not so leggy as the Indian sheep, but does not improve much in the weight of the carcass.

The best of these half-bred were again bred to a pure Australian Merino ram, the progeny being turned three-quarter bred; out of these 50 per cent exhibited a still further improvement but presented perhaps more irregularity than half-breds. There were a few that did not seem to benefit much from the second cross. Those which had good effects showed some points that had to be appreciated.

The wool became longer in staple, finer and softer, and had a decided crimp. The shape of the animals also improved. The wool fetched a greater price in the market and the fleece increased in weight. The wool experts and Cawnpore Woollen Mills Co. gave a very favourable report on the quality of the wool.

The best of these 3-4 bred were again mated with pure Merino rams, which resulted in a very appreciable improvement in the quality and quantity of wool which was valued at the pure merino rates, but the animals rather lacked in carcass and robustness, although their shape was much more like the Merino, *i. e.*, horns of the male lambs and wrinkle on the body were noticed on several animals. Therefore at this stage it was thought proper to cross with a good mutton-typed animal. With this object, six Romney Marsh rams were imported for the purpose, but unfortunately these did not survive more than three months after arrival. However, a few lambs from these were obtained from their cross with half-bred and 3-4 bred ewes. They had lost little in character, although the wool does not appear so fine as that of the female parents but their size seems to be much improved. The proposed crossing of 7-8 by 7-8 could not be conducted, as owing to financial stringency the experiments had to be discontinued.

The mating of half-bred with half-bred (Mendel system)—the result of this was not altogether satisfactory, certainly some lambs exhibited fixed improvement but many seemed to decline somewhat in quality, therefore it was decided not to proceed any further on these lines at present.

Crossing Merino by Merino was not successful, every lamb born died.

The introduction of half-bred and 3-4 bred rams to country flocks no doubt is better than country rams, which shows some effects on the quality of the wool.

The flock at Garhwal had to be abandoned, as it was far away and it was impossible to exercise any useful supervision unless some expert practically lived amongst them, and it would

be hopeless to indiscriminately hand over valuable rams to a lot of ignorant shepherds.

The Aligarh flock had to be transferred, as a disease broke out among young stock.

The Attara and Allahabad flocks were handed over to the Deputy Director of Agriculture and Jamna Mission (The Agricultural Institute) respectively for further experiment with half-bred and 3-4 rams.

The Bikanir mating showed better results than the United Provinces sheep.

The aim of all these crosses was that, by careful selection and grading, we hoped to evolve a fine type of animal of superior wool-growing and flesh-forming capacity which would eventually breed true type and at the same time be able to withstand the vicissitudes of the Indian climate and other adverse conditions. This might be said to be the crux of the whole sheep-breeding experiments. It is comparatively easy to improve the wool or mutton qualities of an inferior animal, but it is a difficult matter to fix the improved type so that they will produce their like when bred together. This requires lots of money, time, and labour. If an improved type is fixed in its breeding it obviates the further importation of expensive stud rams, unless the progeny at a future date shows sign of deteriorating from the standard desired, when it would be necessary to introduce further imported rams ; even when a type is fixed to all intents and purposes, one sees the case of reverting to a former generation ; the course to pursue is to eliminate those animals that throw back or produce undesirable progeny.

CHEMISTRY AND ITS CONTRIBUTION TO AGRICULTURE

PAULINE MACDONALD, ISABEL THOBURN COLLIGE.

In his world-famous book, "Gulliver's Travels," Swift, with severe satire, makes the king of Brobdinguag say to Gulliver, "That whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, would deserve better of man-kind, and do more essential service to his country, than the whole race of politicians." How prophetic these words have turned out to be? The increase has been accomplished, as we shall show by discussing the change in the condition of agriculture. But how few people including politicians as well as farmers know who were the people who enabled such conditions to be established. Looking into the heart of the matter, we will find that the progress is due to the application of Science. Chemistry has played a very special part. One may ask, how has

chemistry benefitted? Agriculture, and how has it contributed to the progress of this industry? One does not have to go deep down into the matter to discover the answer to this question. In fact, just a superficial survey of the subject will be satisfactory. Perhaps a comparison between the state of agriculture in the former times, and the modern agriculture, and the reasons causing the differences between them, will be enlightening.

The essential difference will be found to be that, in former times, agriculture was carried on in the light of experience, while nowadays, it is regarded in the light of knowledge. In ancient days the simplest form of agriculture consisted in growing crops on a patch of ground till it was exhausted, when it was abandoned for another. Even before this, agriculture of antiquity was regarded to be of divine origin. It was attributed, for instance, to Isis in Egypt, Ceres in Italy, and Demeter in Greece. No progress was marked from the simplest form described, until the discovery of bare fallow. Conclusions regarding this fact were drawn from experience. At the same time, the introduction of other crops, instead of bare fallow, is another step upward. These methods were very popular, and no more advance was made till after the middle ages. The leaps and bounds by which agriculture has progressed since the beginning of the last century is purely due to Science. Chemistry has played no small part. We will consider what it has contributed.

Agricultural Chemists have devised means for a healthy growth of vegetation, for removing defects, for protecting plants from disease. Further, they have aided in obtaining an economic value from the farm products. These factors have enabled the farmers to derive a greater benefit from their produce, and also have aided humanity indirectly. Thus it is not hard to see that they have played a great part in producing prosperity.

More important, perhaps, are the practical applications that are made as a result of the researches made by these chemists. The first task they tackled was the study of plant growth. They found that plants are built up by certain chemicals in the soil and in the air. The essential elements for a healthy growth are Oxygen, Hydrogen, Carbon, Nitrogen, Sulphur, Potassium, Phosphorous, Calcium, Magnesium and Iron. Oxygen and Hydrogen are taken in by plants in the form of H_2O. (water), while Carbon is taken in from the air in the form of Carbon dioxide. The other elements are usually found as salts in solution in the soil. An unhealthy growth of the plant is due to the lack of one or some of these elements. Some plants need more of some elements. This varies according to the plant. The Chemist has endeavoured to supply what is naturally lacking, by artificial means. The names of the French agricultural chemist, Bonssing

(1802-1827), and the German chemist, Liebig (1803-1823), are associated closely with this great work. They found that fertilisers containing the essential elements could be made to supply the want, and thus enrich the growth More extensive work was done along these lines by the great chemists Lawes and Gilbert, whose names are associated with the experimental farm at Rothamstead. They found that Nitrogeu, Potassium, and Phosphorous, if formed into fertilisers, combined or otherwise, were invaluable. Experimental results have shown that Nitrogen can only be taken in by plants in the form of nitrates, and cannot be taken in direct from the atmosphere. It was found that the decaying organic matter, was converted into ammonia, and then oxidised till finally it assumed the form of nitrates. This is called nitrification. The carbon dioxide in the soil combines with the water to form carbonic acid. This in turn reacts with ammonia to form carbonate of ammonia, which is then oxidised to a nitrite, and finally a nitrate. This is then taken in by plants as the supply of nitrogen. Another important discovery was that the roots of certain leguminous plants, could "fix" the nitrogen from the air, and this was converted into nitrates. Thus the use of leguminous plants as a crop which is afterward turned in as manure, has proved to be very valuable. Besides this, another element that is essential, namely Phosphorous, has now been obtained in large masses to be used as a fertiliser that has shown good results. This element is taken in the form of soluble phosphates. These phophates are rendered more useful when treated with sulphuric-acid to form "Superphosphates." They are obtained largely from rocky deposits, and not only from bone as formerly. Potassium, is another necessary element, chiefly from waste mineral. The lack of any one of these essential elements may mean a very poor crop. This may be illustrated from the story of a farmer who visited one of the experimental stations. He said that he had bought a bit of land, which had looked very rich, and had built his house near by. The first crops were fairly good, and they expected better crops. As the old man looked first at the treated and then at the untreated land, he burst into tears. He continued his story—relating how his crops had become poorer and poorer as the years rolled on, and how he and his family had been reduced to miserable poverty. Finally he exclaimed, "Oh! what a difference would have been made by a little of that substance you call potassium." Artificial manners have proved of incalculable value to progressive farmers.

In the 20th century, argicultural chemists have turned their energy and thoughts to factors governing plant growth other than the nutritional aspect. One factor studied is the effect of small quantities of other elements, which have hitherto been

thought of as unessential. Most significant among these may be the discovery of the effect of the minutest amount of Boron. Experiments have been made, and it has been found that even the smallest amount of this element exercises an important influence by stimulating the plant to a healthier growth. The effect of the presence of other elements also has been advantageously studied. The names of the French Chemists, Maze and Bertrand, are closely associated with this study.

The effect of the physical condition of the soil is another noteworthy study that has been, and is being made.

The soils exhibit different qualities according to the rocky material of which they are the result. For instance there are sandy soils, clay soils, loams, etc. It has been suggested that soils have properties resembling the colloids in respect to their power of absorption and retention of water. They contain the essential elements, and the water that is necessary for the nutrient solution of the plant-food. Any deficiency is made up by the addition of artificial manners. The soil may be said to be composed of organic and inorganic particles. Plants take in only the latter, therefore the former, if utilised, have to be converted into the latter. Humus, the organic decaying matter is converted by the process of nitrification into nitrates. This is just one significant example. Acid soils are not fertile to many plants. This difficulty may be overcome by the process of limeing. If lime is added, the soil will be rendered fertile.

Another important factor that is being studied by agricultural chemists is the effect on plants of the biological activities in the soil. It has been found that a number of bacteria and protozoa, are actively in work, decomposing substances in the soil. They also have a stimulating effect. For example, the bacteria found in the root nodules of legumious plants, have an active part in the fixation of nitrogen from the air. This field of study has a wide scope, and great benefit is expected as the result.

One of the most important considerations to be dealt with here, is the effect of, and the fight against, plant disease. It has been found that plants suffer from certain destroying diseases caused by bacteria, fungi, and other agents. It has been the lot of chemists to discover cures; fungicides, and insecticides have been invented, which have been a great boon in the field of agriculture. The chemist owns the honour of combating these diseases with success. Many synthetic cures have been invented. Farmers owe a great deal to the chemists for the economic value of their products. A few examples will be sufficient to show this. How much more has the farmer obtained from the better quality of his produce, since the introduction of fertilizers? They have had a better market, not only because of the quantity of the

produce, but because of the quality also. Further, the bye-products which have been obtained, are due to the chemical analysis, and scientific methods of obtaining them. An example may be cited for the obtaining of malt from barley. Again, look at the cereal industry, is not its growth due to chemists who have laboured untiringly? Again, one may turn to other industries. Take the canned fruit, vegetable and meat industry. The sterilisation of the tins and preservation of the produce is due to chemical analysis and processes. A significant way in which chemists have helped the farmers to obtain a good market for good produce may be seen in the fact that chemists can test what is inferior and not at all useful These are just a few examples which serve to prove that chemists have also aided farmers economicallay.

Since agriculture in its widest sense includes the rearing of live stock, it may be well to touch on this subject. Chemists have analysed the food, and studied conditions which will be best adopted for them. Foods which have been recommended by them, and used, are the means of raising up healthier animals. The milk, etc. are also richer, and these in their turn may be purified by scientific methods. The butter and cheese now produced are very good in quality, and their production has grown into quite a flourishing trade.

All these factors considered, show that agricultural chemists have been "the benefactors of mankind", which were predicted in "Gulliver's Travels." It is only a few who realized the important part played by chemists in this progress of agriculture. This science is bound closer to agriculture daily. We might safely say that the future advance in agriculture is mainly dependent on chemistry. Now-a-days, agricultural chemistry is treated as a subject, and not as a means only to solve practical problems. But hand in hand with the opening out of the new knowledge, goes the solving of the practical problems. This has been so beneficial thus far, how much more useful will it be in the future? The knowledge gained opens out a storehouse for inventors, and new discoveries regarding plant growth will revolutionise agriculture. In addition to this, the contributions already made by chemistry, will indeed make all men realise that chemistry is of supreme importance to the agricultural world. Perhaps, then, the agricultural chemists will "deserve better of man-kind", for they will have done "more essential service to their countries, than the whole race of politicians put together."

Bibliography.

Encyclopædia Brittanica.
"Discovery"—Gregory.
Chemical Education (September 1928).
Chemistry in the 20th Century—Armstrong.
Text Book of Botany—Lowson and Sahmi.

"PLACE OF MINERALS IN ANIMAL NUTRITION"

N. R. Joshi, I. D. D.

It is common knowledge that animals require minerals as a part of their daily ration. The lack of knowledge on the mineral requirements of the different classes of farm animals accounts for the fact that they are not included in the present day western feeding standards. But the importance of the subject on account of its great bearing on animal nutrition, is attracting the attention of many investigaters. Also the present cynosure of the Scientists in the field of animal nutrition, the vitamines, has a great bearing on the assimilation of minerals.

Both animals and their feeds are composed of various compounds, but relatively a small number enter into their elementary composition. Usually the following fourteen elements enter in their composition primarily :—oxygen, carbon, hydrogen, nitrogen, calcium, phosphorus, potassium, sulphur, sodium, chlorine, magnesium, iron, iodine, and silicon.

Since all of the substances of the body are continually undergoing disintegration and renewal, it follows that there must be a constant exchange of every element that enters into the body. More or less each element must be metabolized and eliminated each day, and if equilibrium is to be maintained an equal amount must be supplied.

Simple proteins furnish only five of the 14 elements, while fats and carbohydrates supply only 3 out of these. The remaining nine must therefore be furnished by some ingredients of the intake other than proteins, fats and carbohydrates.

These same remaining elements are found to be in the minerals of the food, designated as "ash".

The ash ingredients of the food undergo little digestion other than simple solution. Although they are not sources of energy they help in the transformation of the same. They probably continue in the form of inorganic salts and thus are absorbed by the intestines; some of course combine with the proteins and with them are carried to all parts of the body.

Some of the important functions of the ash constituents are:—

(1) Constructive purposes:

(a) As bone constituents, giving rigidity and relative permanence to the skeletal tissues.

(b) As essential elements of the organic compounds which are the chief solid constituents of muscles, blood, etc. etc.

(2) Carriers of gaseous products.
(3) Control of muscles.
(4) Movement of liquids.
(5) Stimulation of vital reactions.
(6) Assistance in coagulation of blood.
(7) Solution of proteins and digestion of proteins, fats and carbohydrates.
(8) Serve as electrolytes, thus facilitating the chemical reactions of the body, by supplying the material for the necessary acidity or alkalinity of the digestive juices.

The importance of the right concentrations of the inorganic salts and ions in the tissues and fluids of the body is very great. Any departure from the normal is incompatible with life. The one mineral supplement universally fed is common salt—Sodium chloride. Sodium salts occur abundantly in the blood and other fluids of the animal. There seems to be a definite relation between the taking up of salt and the retention of water in the tissues. The effect of decreasing the salt in the feed is to decrease the quantity of salt in the tissues as even as decreasing its water content. Chlorine is used up in making the hydrochloric acid of the stomach and leaves the body in the form of chlorides. Herbivorous animals need more of salt than carnivorous on account of the fact that meat contains chlorine in greater proportion than plants.

Livestock may be allowed free access to salt or they may be fed regularly in grain ration. An addition of about 1 to 1½ per cent. of the grain mix. would be enough.

Sulphur in combination with the proteins is necessary for adequate growth and the formation of wool, hair, etc. It enters the body usually in organic combination with proteins. It is found abundantly in cotton seed, linseed, soy bean, lucerne, and wheat bran. The question whether the animal body can build up its sulphur compound from inorganic sulphur has not been fully investigated. Though inorganic sulphur seems to have a beneficial effect on the digestive tract by controlling the bacterial action.

Potassium: is an element which is also necessary for growth, but on account of its abundance in the roughages it is not supposed to be a limiting element in animal nutrition.

Iron: is an essential element both of the oxygen-carrying haemoglobin of the blood and chromatic substances which seem to control the most vital activities within the cell. It is on account of this that it is so necessary in the ration of the live stock. However, when the soil contains sufficient iron the possiblity of an iron deficiency from the feeds grown there are not great.

Magnesium: is found in complex mineral mixtures in the form of magnesium carbonate or magnesium phosphate, etc. It is thought to possess a laxative property, stimulate the appetite and aid in bone building. Addition of magnesium to the ration, however, is not necessary as it is found in sufficient quantities in feeds like cowpeas, wheat bran, lucerne, linseed, etc.

Iodine is one of the essential chemical elements of the animal body, although it constitutes a very minor part. One of the chief functions of the thyroid gland is to make an iodine containing compound which aids in regulating different functions of the body. Iodine is often lacking in soils distant from the sea. When the iodine furnished by the food is insufficient the thyroid gland becomes enlarged and this is the cause of the most simple 'goiter'. An addition of a grain or two of potassium iodide is ample to prevent goiter.

Calcium and Phosphorus are by far the most important minerals needed in sufficient quantities by the animals.

Calcium forms a great part of the skeleton It is very unevenly distributed in the body about 99% being in the bones. It is necessary for the coagulation of blood and it aids in regulating the action of the heart also.

Phosphorus is required in the manufacture of nuclii and lupins which are present in tissues, specially the nerve tissues. The importance of these two elements is obvious from the fact that about 85% of the bones is made up of calcium and phosphorus. And also, especially in the case of the milch cows, on account of the fact that milk ash constitutes a considerable part of these two elements. Forbes of Ohio has definitely proved that a high producing cow may draw quite large amounts of these elements from the bones in their milk producing period. McCollum and Simmons have proved that calcium and phosphorus in the rations are not assimilated by the animals if certain vitamins are not present. This accounts for the great assimilation of these elements when the animals are on pasture.

RELATION OF MINERAL SUPPLEMENTS TO DISEASES :

The injurious effects of insufficient intake of ash is of course more noticeable in the growing animals. Specially is the abnormal weakness and flexibility of the bones in the young, primarily due to lack of sufficient calcium.

Mineral supplements are supposed to contract certain toxic products produced from certain feeds. For example Tetany in calves and lambs can be averted by feeding calcium carbonate, bone meal, etc.

We noted above that one of the functions of minerals was to establish the necessary neutrality in the body. Due to the

lowering of alkalinity a cordition may be produced known as "acidosis". This is specially so in the case of the young calves before the ingestion of colostrum which on account of its high content of minerals re-establishes the balance.

On account of the lack of a mineral element, iodine, an abnormal condition of hair and thyroid gland may be produced known as 'goiter.'

Lack of minerals sets in all sorts of reproductive troubles. It is also observed that lack of minerals lowers the resistance to diseases.

REFERENCES :—Armsby, Nutrition of farm animals.

Larsen and Putney—Feeding and Management of Dairy cattle.

Savage—Feeding of Dairy Cattle—Series of articles published in the Hosltein Fresian world

Shermen—Chemistry of Food and Nutrition.

McCollum and Simmonds—The New Knowledge of Nutrition.

DAIRY BACTERIOLOGY.

W. J. HANSEN, B. S. A: M. Sc.

In the last number, we discussed briefly the historical aspect of Dairy Bacteriology, the sources of bacteria in milk, the nature of bacteria, the morphology of bacteria and the important factors affecting the growth of bacteria. In this number, we shall discuss the milking animal as a source of bacteria and contamination in milk.

Cow manure has always been regarded as a source of large numbers of bacteria in milk. It has been shown experimentally, however, that this source has been overestimated from the quantitative point of view. The average bacterial content of fresh cow's feces has been variously estimated at from 5,000,000 to 50,000,000 per gram. One tenth of a gram of manure to a pint of milk would increase the count only about 10,000 per c. c. The bacterial content of dried manure is higher than fresh manure, and as milk is usually contaminated with small amounts of dried manure, the count is increased somewhat over the above noted. Cow manure is also a source of intestinal bacteria which grow actively in milk and contribute to its spoilage. Members of the Coli-aerogenes group frequently cause gassy fermentations and undesireable flavors in milk and milk products. The coli-aerogenes group have their natural habitat in the intestinal tract while other members

of the aerogenes group are associated with plant growth. From the point of view of health, fecal matter must be regarded as a potential source of the organisms of Bovine Tuberculosis. The tubercular cow swallows her sputum and large numbers of the organisms may pass unharmed through the alimentary canal and be discharged in the feces.

The coat of the milking animal is an important source of contamination with fecal and soil bacteria. Also, because of the habits of the cow, the coat may also serve as a means of contaminating the milk with bacteria from the mouth. In the case of diseased cattle, this may also be a possible mode of transmitting bovine tuberculosis to milk.

The udder of the cow is also a source of bacteria. At one time it was supposed that milk drawn from the udder was sterile, and would keep indefinitely if outside contamination could be prevented. It was later conclusively shown that the first milk drawn contained large numbers of bacteria and that the numbers decreased as the milking progressed. It is a definitely established fact that the normal udder may and usually does contain bacteria throughout the whole of the lactiferous ducts, including the most minute ducts, where the milk becomes contaminated as soon as secreted. The udder of the cow, therefore, is a definite source of bacteria. The extent of possible contamination varies from animal to animal and from place to place.

The question arises: How do these bacteria enter and infect the udder? First there may be disease germs which have invaded the blood stream and find lodgement in the udder. Bacteria may also enter the udder through the skin by the penetration of sharp objects or by other injuries. The orifices of the teat canals form the third method of entry of bacteria into the udder. From the practical point of view, it is important that the milking animal be free from disease, that injuries to the udder be prevented, and that the surroundings be kept clean so as to limit the number of bacteria that may find entry through the teat canal.

In considering the bacterial content of freshly drawn milk attention must be called to the germicidal properties of milk. There is in blood and other body fluids a bactericidal power. Several kinds of antibodies are known to take part in the destruction of bacteria in the blood. Since the fluid part of milk with many of its constituents is derived from blood, it is not surprising that the milk should contain the same kind of antibodies as the blood. The experimental evidence seems to have established that the germicidal property active within the udder exists to a slight extent after the milk is drawn. It is also agreed that this germicidal property is so weak that it has little practical significance in the preservation of milk. However, it may be an impor-

tant factor in protecting the suckling animal against infection. The transmission of immunity has been found to occur particularly through the colostrum during the first day of feeding. There is no evidence to show that the germicidal property of milk has any significance in human nutrition. However, the value of freshly drawn milk and particularly colostrum milk to the suckling animal cannot be overlooked.

Regarding the number of bacteria that may be found in the udder, a wide variety of results have been shown experimentally by different workers. It has been found that the number of bacteria may vary within wide limits, that the number of bacteria may vary from one quarter to another, that some types of bacteria may persist in the udder for long periods. It has been shown that the types of bacteria which could grow in the udder are limited. There are three general types of bacteria which can grow in normal healthy udders, namely: staphylococci, streptococci, and brucella.

In general, the staphylococci appear as bunches of grapes. Savage, Jones and others have shown that staphylococci are associated with bovine mastitis. There is no evidence, however, that staphylococci in milk are pathogenic to man.

Streptococci appear in chains. There is also a difference between udder streptococci and streptococcus lactis, the common souring organism. This type is also able to produce mastitis or infection of the udder. While the causal organism of mastitis in cows is harmless to man, there is another type of hemolytic streptococcus, pathogenic for man, which does occasionally infect the udders of the cow. This organism is called the streptococcus pyogenes. Milk supplies infected with this organism have been known to cause epidemics of septic sore throats. This organism is easily destroyed by the process of pasteurization.

The type Brucella include the group of minute rod forms of which the organism of contagious abortion is the type species. Although it has been shown that the abortus type may be commonly present in cow's milk, it has never been shown to exist in great numbers. The flora of normal and diseased udders has brought out the fact that the pathogenic organisms that produce mastitis are closely related to organisms that are normally present in the udder.

Of the cattle diseases that are pathogenic to man may be mentioned: Anthrax, Foot and Mouth, and Tuberculosis. There is little danger of the spread of anthrax through milk as the anthrax bacillus does not pass from the blood to the milk until the last stages of life. There is little danger as the secretion of milk ceases in the early stages of the disease. If there is any secretion of milk it is yellowish or bloody in appearance and slimy. The

ordinary dairyman would certainly exclude such milk from use.

In India the most important infectious disease of dairy cattle is that of foot and mouth disease. The disease is caused by a filterable virus, which is little understood. The virus is present in the serum of the vesicles on the mouth, feet and udder; in the saliva, milk and various secretions and excretions; also in the blood during the rise in temperature. The udders often become inflamed and ruined by the formation of abscesses, and cows affected in this way may become permanently valueless for milk production. The milk from cows suffering from foot and mouth disease becomes diminished in quantity and is not readily converted into butter or cheese and remains thick, slimy, and inert. Such milk is fatal and dangerous for use, causing diarrhoa in suckling calves and serious illness in human consumers. The disease usually develops in a mild form in human adults. In children the disease is often more severe and may lead to death. In the United States the outbreaks have been largely controlled by quarantine measures. The prevalence of Foot and Mouth disease in India is one of the serious drawbacks to the development of the Dairy Industry.

Bovine Tuberculosis has received more attention than any other cattle disease in the United States. This has been because of its wide distribution. Steps taken, measures drawn up and rigidily enforced have been productive of results. Large areas now exist where the cattle are free from tuberculosis. Early workers considered that Bovine and human tuberculosis were the result of the same causal organism. It has since been shown that two types of organisms exist. The significant fact is that the bovine type of tuberculosis may cause tuberculosis in man. Milk from tuberculous cows is a decided danger to adults and children and also transmits the disease to calves and other animals which may be fed with it. The only relief, in these days, lies in the fact that the pasteurization of milk destroys these pathogenic organisms. The pasteurization or boiling of milk is a real safeguard.

THE PLOUGH

D. Haldar, L. M. E. (B. H. U.)

The progress of the Western civilization is marked by the improvement of the plough. The pre-historic plough was the crooked stick drawn by man. It was merely a scratching tool. Every man was his own draught animal. Somehow the farmer and his family could manage to eke out their existence with this crude method of tillage. In India too we find reference to this

kind of tool in the hands of Balaram, the brother of Sri Krishna who is considered to be the father of Indian agriculture. Balaram used to carry a plough as his emble.. and was also called by the name of Hala-dhara or the carrier of a plough.

In ancient Egypt a form of hoe made from a crooked stick used to serve the purpose of a plough.

The Roman plough which Virgil describes used to be made of two pieces of wood meeting at an acute angle and plated with iron.

In the middle ages no improvement of the plough was noticed. The Dutch were the first people to greatly modify the Roman plough. They first conceived the fundamental ideas of the modern plough. They made their plough with a curved mouldboard, a beam and two handles. In England in the beginning of the eighteenth century the Dutch plough served as a model. Men like, P. P. Howard, James Small of Scotland, Robert Ransome of Ipswich, made a permanent contribution to the improvement of the plough, after the Dutch design.

In America after the Revolutionary War the English plough was gradually replaced by ploughs made in the United States. Among those who gave first thought to the improvement of the plough, the names of Thomas Jefferson, Daniel Webster, Charles Newbold and Jethro Wood are prominent. The last and not the least was Jethro Wood. No man benefitted his country pecuniarily more than Jethro Wood, and no man was as inadequately rewarded.

Ransome in England and Oliver in America were the pioneers in making chilled share. John Lane in America first developed the soft centre steel and made the share of his plough of the same material.

The modern steel walking plough owes its present shape to the great American manufacturers in general and to John Deere and William Parlin in particular.

The Indian plough is a wedge-shaped toothed implement provided with one handle, a long wooden beam and a long iron pointed share all attached to its wooden body. It stirs the soil all right but inverts it very little. It closely resembles a medieval plough. It takes much time and labour to prepare a seedbed with this plough. Some of the improved ploughs were introduced in India to expedite the tillage operation. The net result was not very hopeful. In 1893, Mr. Bhupal Chandra Basu wrote in his *Notes on Indian Agriculture*: "Efforts have been made in India in recent years to introduce *soil-inverting* ploughs made on the patterns of those used in Europe and America, but these have as yet met with a very small measure of success. It is a standing controversy whether *soil-inverting* is at all needed in India." We cannot say even now with much confidence whether those

improved ploughs have really solved our tillage problem, here in India. Now-a-days in America it is a general practice in extensive farming to disk the field with a disk harrow in order to make a surface mulch thus saving moisture and mix stubble and trash with soil. After disking operations they resort to their usual ploughing with a mouldboard plough. It has been found that a field ploughed without disking first, contains large air spaces through which roots of growing plant cannot extend. Soil dries out quickly as trash tends to prevent contact between furrow slice and subsoil. Even disking after the usual ploughing does not help to break up those air pockets. In India, we find only disking is sufficient to prepare a fair seedbed. For seeding purpose also just like the country plough we can attach to each disk of a bullock disk harrow a *mala-bansa* or a bamboo funnel. Thus the bullock disk harrow seems to be the implement which can replace our country plough with good advantage. It can be like the country plough, of universal application.

Considering the economy of time and labour effected by the mouldboard plough in comparison with the country plough we cannot brush aside its claim as one of the most important farm implements. Mr. Basu rightly points out the injudicious tendency of the manufacturers of the improved or imitation ploughs to conform as nearly as possible to the pattern of the ordinary Indian or country plough in order to commend them to the simple intelligence of the raiyats. The improved ploughs are provided with a broad curved iron-piece called mouldboard. Otherwise they are similar to the country plough. The mouldboard helps considerably in reducing the draught of a plough. The flat surface presented by the body of the country plough offers a considerable amount of resistance to the moving soil. There are country ploughs in use in the Noakhali district in Bengal (and also in South Canara, Madras) which closely resemble a ridging or a double-mouldboard plough. In Saidapet farm it was found that :—

1. An ordinary native plough, the dead weight of which was only 32 pounds, needed a force of 390 pounds to draw it through the soil.
2. An ordinary native plough, with some slight improvement, the chief of which was the removal of the upright flat surface behind the share by cutting down both sides, the dead weight of the plough being then 36½ pounds, required a force, to drag it when working, of 336 pounds.
3. An ordinary native plough, improved as in No. 2 experiment, and fitted with a wooden mouldboard, the dead weight being 56 pounds, required for dragging it a force of 280 pounds only.

All the three ploughs were doing the same amount of work, *viz.*, moving two cubic yards of soil in each 100 yards of furrow, and were all dragged in a uniform way by coolies. The addition of a mouldboard materially lessened the draught. The objection of the raiyats to use the modern walking ploughs is their inability to reach out their hands to twist the tails of their bullocks for urging them to move. This objection can be easily met by asking them to learn how to use reins for guiding the bullocks. One of the most essential things in good ploughing is the good handling of the bullocks. The double stilts or two handle ploughs have a distinct advantage over the single or one handle ploughs. In the former the ploughman walks in the furrow cut by the plough itself. The bare-footed Indian ploughman will find no impediment in his way to follow the plough. It is easy also to get a straight furrow in the two handle ploughs. In the single handle ploughs the ploughman walks on the unploughed grouud and it becomes very difficult for him to keep the furrow straight. Although there are two handles the ploughman scarcely requires to hold the plough with two hands. By practice the ploughman may manage his team with the rein or line wound round his waist occasionally using his hand whenever he may require to turn round for the next furrow. As regards the size of the beam again we find Mr. Basu is right. He wrote in his *Notes on Indian Agriculture* : " Let us now see in what respects the short beam of the ploughs in Western countries differs from the long beam of the Indian plough. The difference in principle arises solely from the mode of attachment to the yoke. In the former, the beam is attached to the yoke by chains (called "traces') which, being flexible, adjust themselves at the proper angle to the plough ; in the latter, the beam is attached directly to the yoke, the angle of attachment being adjusted once for all. In the former, the line of draught, which is represented by the chains, naturally adjusts itself at the angle of least resistance which is attained when the line passes through the centre of the resistance offered by the soil to the moving plough. In the latter, the line of draught, represented by the rigid beam, crosses the plough above and below the share ; this tendency has to be kept in check by the ploughman constantly pressing down the handle, and thus adding to the draught of the plough". Thus there is a distinct advantage in the short beam over the long beam which we find in our Indian plough.

There are short beam two handle imported ploughs to be had from Rs. 30 to Rs. 60 each. These ploughs are designed in the proper modern shape and completely made of steel or chilled cast iron. The draught of an ordinary pair of bullocks is sufficient to work them. They are durable because they have been

constructed of good material.

The price of a bullock disk harrow may not be within reach of the capital an Indian farmer can invest. The next best thing for him is to use one or two of those imported double handle short beam ploughs his purse can buy.

It will not be out of place to mention here that sometimes a horse or bullock hoe or cultivator which is generally used in interculture may be used with profit by the Indian farmers. The price of the cultivator will not be more than Rs. 60. By attaching *mala-bansas* the cultivator may be used for sowing seeds also.

We consider that the disk harrow, or the two handle short beam steel plough or the cultivator will be a distinct improvement on the country plough.

THE BLISTER FLY.

I. D. Caleb, M. Sc.

Last year during the months of August and September *i. e.*, towards the latter half of the Rains, I noticed several of our students had blisters of various sizes on different parts of their face and arms. They all seemed to know that a "blister fly" had sat on the spot where a large painful blister appeared, but there were several who had never seen this dreadful pest and imagined it to be something like the ordinary housefly.

Since this "blisterfly" is found so abundantly on our farm during certain months, I feel a short description may be of use to the students.

To begin with, the "blisterfly" or Spanishfly, as it is commonly called, is not a fly at all. It is a beetle, belonging to the family *Meloidae*, and is named *Lytta Vesicatoria*.

Beetles, according to Sedgwick, are classified as follows:

Class—*Insecta*.

Sub-class—*Endopterygota* (Insects in which wings arise by invagination of the hypodermis, and for some time remain tucked in the body. Metamorphosis is complete).

Order—*Coleoptera* (Insects in which the anterior wings, called Elytra, are hard, and when at rest, they cover the functional hind wings and come together with a straight median juncture. Mouth parts are of the biting type with stout mandibles. The second maxillae are much forced to form an effective lower lip. Metamorphosis is complete and larvae are grub-like; pupa soft and exhibiting the parts of the imago).

The Spanishfly is looked upon by horror by most, especially students who study by lamp-light. Being attracted by light the

insect makes straight for the lamp and then for the unfortunate reader's face and hands.

The Spanishfly varies from about 1 cm. to 2.3 cm. in length and has a pretty golden or bluish green colour. The male is smaller than the female. It is found abundantly in the Mediterranean region especially in Spain, South of France and also in Germany and some parts of Russia. They are seen for a very short time during the year, which led people to think that they were migrating forms. But this is not so. It is due to their short adult life and peculiar larval stage and metamorphosis that they appear and disappear so abruptly.

The cause of blisters is Cantharidin which is given out from the body of the insect when it sits. Cantharidin is the anhydride of cantharidic acid. It penetrates the epidermis of the skin and produces local irritation. One-tenth of a mg. is sufficient to produce a blister on the human skin within a few hours. Robiquet was the first to extract cantharidin from *Lytta Vesicatoria* in 1812. It is used as a remedy for baldness and other troubles, but it has a bad effect on the kidneys causing nephritis. These beetles are attracted by bright light at night so can be controlled by having a bright light over a trough of water containing some sort of poison. Mosquito-proof doors and windows are recommended in hostels, but if these are not present, students are advised to read under a mosquito curtain.

SOCIAL SERVICE WORK BY STUDENTS.

C. P. Dutt, M. Sc.

The system of education and the particular environment under which the students are brought up in the Institution led some of them to think seriously of some of the social problems of the country. But no practical shape could be given to it until the beginning of the fall when the organization was formed under the name of "Discussion Group", with its weekly meetings. The discussion on the various questions infused its members with the desire of service and shortly afterwards the Discussion Group gave place to the present Social Service League with its extended activities.

The aims of the Social Service League are as follows:—

(*a*) To discuss social and religious problems among the members and their neighbours.

(*b*) To aid and cooperate with the neighbouring villagers to better their social conditions.

(c) To provide:—

1. Medical aid to the sick.
2. Milk to the needy.
3. Games to the children.
4. Better sanitation, and
5. Increasing literacy.

It is a student organization, though the membership of the League is open to all persons connected with the Allahabad Agricultural Institute. There are about 40 members at present on the roll including the faculty members.

It has a "Village Welfare Fund" which amounts to about Rs. 150. A part of this sum has been raised by the manual labour of the members and the rest has been contributed by the staff members and the students of the Institute.

The League has almost all the different religions represented in its members, so the discussions on various subjects are very helpful in cultivating the spirit of tolerance and better understanding amongst its members. About twelve different subjects have been discussed. Some of them were: Religion, Prayer, Worship, Brotherhood, Charity, Faith, Great Men of the World, Salvation, Sacrifice and Honesty.

The members frequently visit the surrounding villages inquiring about the cases of sickness. Cases have been taken from places as far distant as Shahji-Ka-Purwa. Milk and Cod Liver Oil have been supplied for the children whenever the physician advised. A brief synopsis of some of the cases is given below:—

1. Sarya, three-year old daughter of Konsillia, a widow of 22 years (mother of three little children, the eldest being a girl of 9 years) was brought to the dispensary and milk and medicine were provided for her.

2. A boy named Gopi, son of Manu, resident of Shahji-Ka-Purwa, was in bed for the last four years, suffering from pthises and sore feet. He was provided with medicine and one seer of milk daily for more than a month.

Apart from medical aid, recreation has been provided for the young boys in the adjoining villages. A few tennis and rubber balls have been distributed amongst the children. A foot-ball game has already been arranged for the grown-up boys in the village Mahewa. Enough interest for the games is created amongst the children when the members themselves play with them. This also gives a chance to the members to mix with the village folks.

An effort has also been made to arrange for the education of the young boys in the villages. The response to the Social

Service League's educational scheme has been very good. Out of about 75 children of school-going age, 65 have been attending the Social Service League's night school.

About 30 cases for financial help were reported to the League. The League, with the idea of dispelling beggary, always hesitated to help any person who can earn his living by work.

The Social Service League through the Principal arranged to have all the work around the Hostel and the College buildings done by the students. The scheme has proved very beneficial in dispelling the dislike of manual labour from the hearts of the students. The students have worked for more than 900 hours since the scheme has been put up, at the rate of three annas per hour.

During the last Allahabad Fancy Show and Fete the League along with the Institute authorities took the responsibility of demonstrating to the public some of the up-to-date methods of dairying and farming. Steps have already been taken to help in every possible way in the coming Kumbh Mela also.

Before concluding the statement for the term under report it may be added that though much has been attained in the lines originally chalked out, yet there seems to be an ample and vast scope for the League to extend its activities. It must be remembered that all that has been attained is done by the students after their college hours.

IMPORTANCE OF MILK IN THE DIET.

Mrs. W. J. Hansen, R. N.

The definite establishing of milk in the human diet during recent years has been of very great benefit to mankind. It is in fact one of the most important discoveries of science. A few years ago milk was considered a food for young children to be discarded as soon as the child could digest more solid food. Today science proves that milk is our most valuable food, not merely in childhood but throughout our whole life.

The ideal food should contain all elements required by the body for repair, up-building, energy and for normal health—milk not only contains all the food elements necessary for complete nutrition, but it contains the food elements in such proportions as are necessary so that life and health can be maintained for an indefinite period on milk alone. Milk has the fats and carbohydrates necessary for heat and energy, the proteins needed for tissue building, and the vitamins and mineral salts so necessary for perfect health. These elements are all combined in an easily assimilated form.

Every growing child requires a quart of whole milk per day and adults a like amount, not necessarily taken as a beverage but it should be used in some form. Many people do not care to drink milk. There are many palatable ways in which milk may be supplied in the diet.

Sometimes it is better to give the milk in some cooked form or to disguise the milky taste which the child or adult finds objectionable.

These may be helpful suggestions:—

I. Be sure the milk is served cold or hot—often the objection comes because the milk is lukeworm Hot milk seasoned with salt and pepper is sometimes preferred to cold milk.

II. Cook the breakfast cereal in milk instead of water. If a double boiler is used there is no danger of it scorching, whole wheat, oatmeal, rice, etc. are delicious when cooked in milk.

III. Toast with hot milk poured over it is a favourite in most homes.

IV. Serve cottage cheese with cream, sugar and a little cinnamon.

V. Serve cream soups as often as possible. They are especially good made with fresh vegetables, and children will in this way get a cup or more of milk at the meal and secure the vitamines and mineral salts in the vegetables as well.

Recipes for Cream Soups.

Cream of Spinach Soup. Wash and chop spinach, cook slowly in very little water, when thoroughly cooked press through a coarse sieve. Heat two tablespoons of butter, add two tablespoons of flour and cooking in four cups of milk until smooth and creamy, add the spinach, beating until smooth.

Cream of Pea Soup.

1 quart green peas.
1 small onion.
1 bunch parsley.
1 quart white sauce.
Salt and pepper.

Boil peas, onion, and parsley all together until tender. Rub through a sieve. Combine this with one quart of white sauce and bring to boiling point. Do not allow to boil. Season to taste.

Cream of Carrot Soup.

2 cups chopped carrots
1 onion.
1 tablespoon chopped parsley.

Cream Sauce.

2 tablespoons melted butter.
2 tablespoons flour.
2 cups milk.

Boil carrots, and onion together in salted water until tender, wash and add to cream sauce, also adding two cups of water in which they were cooked. Just before serving add the finely chopped parsley.

Combining milk with other foods in this way has been found to overcome the prejudice with regard to drinking whole milk. Milk should form the base of the diet of every normal person.

SILO AND SILAGE IN INDIA

S. R. Misra-Fieldman.

Students of agriculture know that the silo has become a necessary adjunct to the equipment of the farm, especially the Dairy Farm. The value of silage is incalculable in the case of Indian farmers. The practice of making silage needs to be introduced and encouraged. Once a New York farmer said "I would as soon try to farm without a barn as without a silo." This remark is full of truth and it is due to the non-existence of the silo in India that Indian farmers are courting a series of troubles which could otherwise be easily averted.

Let one go a little distance from cities into the rural areas where motor cars cannot travel. There one will see the sad condition of cattle, especially on a winter morning, standing in the open, shivering with cold, and, picking up some dry stalks of paddy. Excessive cold, no protection and bad feeding cause great risks to their lives. The greed of the village farmers for increased production makes them cultivate all the land about their villages leaving hardly enough place for cattle to move out and graze. The little pasture land that is so seldom left is very badly cared for and is not worth much. If the straw (Bhusa) yield happens to be insufficient in the winter season, as is almost always the case, farmers run, towards the end of the rainy season, to purchase paddy straw, dry juar and bajra stalks—which are poor feeds bought at a high price. In all these cases and several others the silo and silage would go a long way to relieve the rural agricultural condition. Men of scientific attainments in agriculture and dairying have provided exhaustive literature on the silo, and here the Allahabad Agricultural Institute working as it is among the surrounding farmers and under local conditions has extended some of its own simple practical lessons to farmers.

There have been many of the visitors to the farm who have questioned what " Silo and silage ' mean and so, for non-agricultural readers, it may be of interest to say that a silo is a structure with air-tight walls for the preservation of green fodder in a succulent condition, and silage is the feed taken out of a silo after the green fodder has undergone fermentation. The silo is the container ; the silage is the preserved fodder.

The Institute has seven pit siloes of 22 ft. to 30ft. in depth, and 19ft. to 22ft. in diameter. This last kharif season about 17,000 mds. of Maize and sorghums, and about 10,000 mds. of grasses and weeds have been ensiled. All the siloes were filled to their capacity. The preservation of this huge quantity of fodder in good succulent condition is possible only by this process. The silo affords a great economy of storage. The seven pit siloes which hold the above mentioned amount of fodder occupy about 3,438 sqr. ft. of earth's surface, or about .08 acre whereas the same amount of karbi, if stacked loosely in fields as is usually the common pratice, would have required not less than 5 acres of land for stacks. Professor Alvord states that an acre of corn, field-cured, stored in the most compact manner possible. will occupy a space ten times as great as in the form of silage.

Fodder stored in the silo is quite safe from fire, rain and storm and damage by wandering animals. Fodder stored outside loses about half of the green food-value and the remaining portion has still a lower digestibility as the loss falls mostly on nitrogen-free extract which is the digestible portion of the feed. Silage is succulent, palatable and mildly laxative and thus has a very beneficial effect on the digestion and general health of cattle. Silage is a better feed having a nutritive ratio from about 1 : 15 to 1 : 21 prepared at a less cost than any other roughage feed.

The Kharif crops have to be weeded. Out of all the weeded grass and weeds whatever is needed for the work-men and the dairy cattle is given to them and the rest is thrown uncut into the silo, evenly spread and tramped, and not left or thrown outside either in the fields or near the barn merely to rot and waste as is commonly done in villages. The cost of weeding is not borne only by the crops weeded but also shared by cattle and silage stock so that where the weeding costs Rs. 5 an acre, Rs. 3 will be borne by the actual crops and Rs. 2 will be debited to silage and cattle-feed accounts. In this way cattle also are supplied with cheap roughage. Most of the weeds and some grasses are not well liked by cattle in their green state, but after being ensiled they turn into feed. These ensiled grasses and weeds along with maize, juar and Bajra silage gives a pleasing acid smell which attracts the cattle. They eat it with great relish and pass the winter season and some part of the summer with a

comfort which to the most of village cattle is unknown.

Silage allows us to use all the coarser stuff on the farm as bedding for the work animals who thus are given shelter from the cold of winter. All that stuff mixed with urine and dung is either trenched in fields or put on the manure-pile. During winter there are two great requirements for cattle. One is that they must be fed well and the other is that they must be protected from cold. Paddy and millet straw which could have been very profitably used for providing shelter from the cold, forms generally the main roughage feed for cattle in villages. All straws range from 1 : 36.9 to 1 : 45.6 in nutritive ratio, and from 7.4 to 17.3 in potash-content in 1,000 lbs. so that straws are perhaps the poorest feed, but excellent manure. Silage enables a farmer to reverse the present bad practice of feeding straws exclusively to cattle in villages by utilizing it for winter bedding for live-stock and manure, and thus to maintain the fertility of soil.

In cutting fodder for making silage we have to see not only the economy of cost but more so the economy of time. The Power-driven silage-cutter best meets the above two requirements. With costs of supervision, depreciation on machinery, interest on capital, repairs, besides the running cost it has come to about 40 mds. a rupee to cut and fill green Karbi (fodder) last Kharif season with our silage cutter (power-driven) having the blow-pipe 9″ in diameter. Ordinarily the running expenditure (Pay of the Driver and wages of 8 Beldars to handle the Karbi loads included) of the silage-cutter comes to about Rs. 22 a day with tractor and about Rs. 16 with Crude oil engine. With usual interruptions it cuts 50 to 60 mds. of dry bajra karbi an hour and cuts not less than 4 times as much of green juar Karbi. If running smoothly this silage-cutter can cut 2,500 mds. a day on a running cost of Rs. 22 *i. e.*, turning out 7 mds. an anna. To be a bit more liberal, we get at least 6 mds. per anna, beyond any doubt, besides the greatest economy of time.

Besides the big silage cutter we have also got a hand Chaff-cutter which has cut 6 mds. an hour, but making allowance for the idling of labourers we have been getting 40 mds. a day of 8 hours for more than a month. To cut this amount we had employed 4 men paying them Rs. 8 per day so that it had been coming to 1 md. 27 seers for an anna. This cost will differ according to the local wages but to get 2 mds. for one anna is not difficult. To cut with Gandasa which is commonly practised in villages a man can hardly finish more than 6 mds. of green Karbi in a day *i. e.*, one anna per. md. or if he cuts paddy straw or dry bajra or juar karbi to cut 4 mds. a day would be almost the maximum amount *i. e.*, turning out one maund for one anna and six pie. Besides the

comparative greater cost in cutting with Gandasa, the greater waste of time is also to be kept in mind.

The hand chaff-cutter which costs about Rs. 80 and is fit to serve the purposes of moderate landowners adequately is apt to win wide appreciation among Agricultural classes. A man who farms, say 50 acres, can keep one hand chaff-cutter and a silo 24 ft. deep, 12 ft. in diameter or two siloes for that capacity, very profitably ; 1200 mds. of green fodder can be very conveniently cut in a month with this chaff-cutter and deposited in the Silo. In ordinary conditions the above mentioned amount can be produced from 3½ to 4 acres of land. The net expenditure from the time of plowing of the above area to the time of siloing would be from Rs. 160 to Rs. 125, may be less but not more than this. Making allowance for all possible losses 1200 mds. when ensiled and opened after one or two months would be 1000 mds.—never less than 900 mds. On this quantity of silage at the rate of 50 lbs. per day per head of cattle, which is the maximum amount that an ox can eat, 10 to 13 heads of cattle can be very comfortably maintained for 6 months. The cost of silage making and the area under fodder can be further lessend and wastes utilized of all sorts of grasses and weeds that a field produces during Kharif, be put in the silo, the remaining portion of which can be filled with maize, juar or bajra or all the three. Our own 32 heads of working live-stock hardly finish two silos 22 ft. deep and 19 ft. in diameter in seven months, the net cost for which being Rs. 680.

All of our siloes are under ground, cylindrical in shape, brick-lined with cement coating and have tin roofing over them. Siloes are built overground too and may be built round, square or rectangular. Round silos are more general due to their advantages in point of cost and capacity and also being useful in other ways. A round silo having the same number of sqr. ft. of wall surface and depth will hold about 36 p. c. more than a rectangular silo and about 22 p. c. more than a square one. A round silo will require less material than other forms and so is cheaper. It will resist better the lateral pressure of stored silage. A round silo will expose less surface and so there will be less spoiling of silage. In rectangular or square siloes there is always a great wastage of silage in the corners A Silo should be deep, not much wide, of air-tight and smooth walls. Siloes may be made of wood, bricks, or concrete. A wood silo is cheaper than any but is more easily attacked by silage juices and is apt to decay soon. A wood silo plastered inside will be better than wood alone. Brick siloes with cement plaster and especially the concrete ones though more costly are of far greater longevity. The cost of building a silo differs much according to the local conditions as to the price of labor and materials. It may cost from Re. 1 to Rs. 5 per ton

capacity. For one who cannot afford to build pucca siloes it will pay to make kachha siloes *i.e*, dig holes or pits in the ground into which fodder can be dumped and then covered with a layer of dirt to weight it. There should be some kind of roof over them to protect them from rains. Even this method of making silage requiring very little cost has given very good results and can be very advantageously followed by Indian farmers.

The silo is a great help to a farmer to enable him to maintain two heads of cattle in far better condition where he could maintain only one without it. It is a boon to present day Indian agriculture and in this country where soils are so well suited to the production of fodder crops, and where farming depends mainly on cattle, the silo cannot be ignored without a great setback to agricultural progress.

EDITORIAL COMMENT, ABSTRACTS AND EXCHANGES.

The Milch Goat.— It is with pleasure that we draw the attention of our readers to the recent importation of purebred Toggenburg Goats into India, by Mr. E. A. Slater of Etah, U. P. India.

There is no doubt that the goat has a place in the Agricultural economy of India. Its place is less enviable than that of the water-buffalo, at the present time. While goats are primarily browsers it would seem that the majority of them in this country are kept to clean up brush and destroy weeds on brush land. The goat is also looked upon as an animal that will consume any rubbish. Now, while they will clean up a lot of food that would be otherwise wasted, they cannot act as scavengers and produce profitable yields of milk. Milch goats like dairy animals respond to good care and management. A great deal remains to be done in India to improve the feeding and management of goats. We trust that in attacking the problem of improving the goat of northern India by crossbreeding, Mr. Slater will also contribute to the standardization of methods of feeding and management by the villager for the maximum, economical, production of milk.

Sheep Breeders.— Improve your sheep by the use of an improved ram. We have on hand a number of improved Crossbred Merino Rams for disposal. These Rams can be depended upon to increase the quality of the wool, the texture of the wool, and the leg of mutton, when crossed on the desi sheep. The price of these rams varies from Rs. 5-0-0 to Rs. 15-0-0. F. O. B. Allahabad, depending upon the age and breeding.

Send in your order to-day, to the Dairy Manager, Agricutural Institute, Allahabad.

Herd improvement in India.—The aim of all breeders in India is to improve the herd. This is equally true in the grading up of the indigenous breeds and the crossbreeding with foreign cattle.

In order to improve the herds of Indian cattle two things are of prime importance and necessary :

1. To test the cows.
2. To prove the sires.

The breeder then asks : " How can these things be carried out ?" The reply is simple but the operation is seemingly difficult, judging by the lack of any effort in this regard. The answer is : "Maintain herd records."

The question then arises, which is the most economical and practical methods of maintaining herd records in India? The Editor will be pleased to receive contributions from those who have had experience on this question, in India.

Adobe Construction

J. D. Long.

(A recent bulletin by J. D. Long of the University of California, College of Agriculture, No. 472 of September 1929 has much of interest for builders here in India. The following lines abridged from the 56 page bulletin will give an idea of its contents and probable value to any one interested in the subject of the use of earth in other forms than burned brick for building construction. For want of space we could not give a detailed account of the bulletin.)

Natural earth, or soil, has been used as a building material in almost all countries and by almost all civilizatians.

The civilizations in Mesopotamia, Egypt, India, Mongolia, Morocco, Italy, Spain, France, Germany, Russia, Scandinavia, England and the Americas have made use of unburned bricks and " green bricks". What is said to be the first building erected by the white immigrants in what is now the the United States is the " Palace of the Governors " built in Sante Fe, New Mexico, in 1609 of sun-dried, or " adobe " brick.

Several methods of constructing earth walls have been developed. These may be divided into two general classifications: those in which the soil is used merely as a filler, and those in which the soil itself attains sufficient strength to carry both its own weight and that of the roof or other structural members resting on the wall. Five structural systems are used in modern earth-wall construction. These are the so-called " cajon " method

which comes under the first classification, and the "poured adobe," "cob," "adobe brick" and rammed earth construction, all coming under the second classification. All five methods are commonly classed as adobe construction. Each method requires a manipulation of moist or wet soil to "puddle" it. In the puddled state the soil grains are brought close together so that there is a mechanical locking between the angular soil particles, and so that the surfaces in contact can be cemented by the very fine clay particles or colloids, in the soil. Organic material in soil is usually of a spongy nature and apparently opposes both the mechanical locking and the colloidal cementation of the grains. For this reason it is usually advised that the top six to twelve inches of the surface soil be discarded in adobe construction.

Cajon or Wall Filling Material.—This method is one in which the soil is used merely as a filler and is dependent on other materials for structural support. The structural framework of the wall is made up of wood timbers, and the earth is placed between these to form the solid wall. The term "cajon" coming from the Spanish, means in this usage "wall filling material".

Poured Adobe or Mud Concrete.—The poured adobe method of construction modifies the canjon method to the extent that no wood studs are used, but thoroughly mixed mud is poured between forms directly in place in the wall and allowed to dry. The forms are removed, and the mud wall alone supports the roof load.

One method of forming such walls is to handle the mud much as monolithic Portland cement concrete is used in common practice. Water is added to the soil, and the mass is thoroughly mixed to a mushy consistency. Straw or vegetable fiber may be added. The mixture is then shovelled into wall forms. As with concrete, the water content must be adjusted to give the most workable mass.

Another method of forming is to erect 2 by 4-inch studs every two feet on either side of the foundation, nail 1-inch boards horizontally to their inner surfaces to the height desired for the wall, and draw the two sides of the form tightly together at the desired width with tie wires. The wall is then poured as rapidly as the soil can be fixed and carried into place, pourings being kept at an approxmiately even height to equalize the pressure on the forms. When the mixture has dried sufficiently to retain its shape, the wires are cut and left in the wall, the forms are removed, and the remainder of the structure completed. The name "poured adobe" is a logical definition of the procedure of the method. Another name which has sometimes been applied is "mud concrete".

The English Cob.—Cob is a stiff mud piled in relatively thick layers directly in the wall without using forms. The mud must be mixed to a stiff consistency so that it will have little tendency to slump.

Straw or some other organic fibre is usually mixed with the mud and the mixture then laid in place along the length of the wall in layers as high as they are thick, the thickness frequently being 3 or 2½ feet. After being solidly compacted and shaped approximately to the width desired with the forks on which it is handled, the mud is allowed to dry. Before it has become entirely dry, a board is placed on top of the layer to serve as a straight-edge, and the sides of the layer are trimmed plumb with a hay knife or similar tool. Another layer is placed on top of the completed layer and the process continued until the wall reaches the desired height. It is supposed to derive its name from the use of cobble stones, which in certain localities were dropped into place in the mud layers as the work progressed.

Sun-dried or Adobe Brick.—Brick may be moulded from a stiff mud, dried in the sun, and laid up in a wall by methods similar to the laying of the standard burned brick. Straw is usually added to the mud mixture from which the bricks are moulded. A common procedure of the Mexican workmen who do most of this work in the south-western part of the United States is to spade a six-inch layer of the area intended for the basement. A layer of straw or grass about one and a half inches thick is then spread over the spaded soil; horse manure is frequently preferred, apparently because the straw in it is usually broken into relatively short lengths which work more readily into the mud.

The forms in common use for moulding the brick are constructed of surfaced lumber, fastened with wood screws, and are usually of a size to form bricks 4 by 12 by 18 inches. A brick of this size will weigh between 40 to 50 pounds, about the maximum weight for convenience of handling. It has a volume of one-half cubic foot, and its shape and dimensions are such that it will work readily into walls of 12, 18, 24, and 30-inch thicknesses.

"Sun-dried brick" is probably the best descriptive English term to apply to this form of building, but the name "clay lump" which is applied to such construction in English is also good. In the southwestern United States the method is commonly known as "adobe brick" or "adobe" construction. The word "adobe" comes from the Spanish verb "adobear" meaning "to knead".

Rammed Earth or Pisé de Terre.—This method consists of tamping moist earth in place in the wall between forms. The soil should be just moist enough to hold together in a ball when it is squeezed in the hand, and yet dry enough to fall apart when dropped to the ground from waist height.

The rammed earth method is frequently spoken of by its French name, pisé de terre.

Rammed Earth blocks.—A limited amount of work has been done with rammed earth pre-cast into blocks of convenient size and shape, which can be laid up in a wall as adobe bricks are laid. Such a procedure obviates the use of the heavier, more expensive forms required by the stantard process and gives to the rammed earth the same adaptability to working conditions as the sun-dried brick.

Choice of construction method.—The choice between methods depends upon the soil to be used, the climate, the size of the working crew, and the preference of the builder.

Conclusions.

1. The practical and economical value of earth as a construction material for small structures in California, particularly farm buildings, has been proved through the actual erection and use of such structures.

2. Three methods of incorporating the earth into walls appear practical for use by present day builders in this state: the sun-dried brick, the rammed earth, the poured earth. All the methods of using earth as a structural material are termed "adobe construction".

3. Any intelligent person familiar with standard construction principles can utilize any of the methods of earth wall construction without fear of failure after studying the peculiarities of such construction and making a few tests to determine the characteristics of the soil to be used. The apparent strength developed in the test specimens and the amount of cracking occurring as the mud dries can be used as an index to the stability of the soil. Amateur builders should complete the construction of some small structure before attempting any large building project.

4. The selection of the method to be employed depends on the type of soil to be used, the climate, the number of workmen to be employed, and the preference of the builder. The final results secured in the building are similar, regardless of the method employed.

5. Because of the characteristics of the material, and the manner of its use, certain modifications of standard construction practice are necessary. A study of the soil itself is the first necessity before any building project is undertaken. The effect of admixtures to the soil of reinforcements to be placed in the wall, and the design of foundations, roofs, and openings, should be understood.

6. Earth-wall construction is inferior to most standard construction materials in earthquake resistance, but adobe structures have withstood earthquakes in this state with little or no apparent

damage. Skilful and intelligent workmanship and the incorporation of certain reinforcing design features will help to minimize the damaging effect of earthquakes.

7. Careful planning is necessary to secure the most economical and satisfactory results with adobe construction.

8. A protective coating should be used on adobe walls to guard agains' mositure and mechanical wear. Cement, lime and mud plasters, various paints have been used with success.

9. The advantages of adobe are that it is a native material of adequate strength and durability for residences and small structures, and a material generally economical to use. Attractive, sanitary, comfortable, fire-resistant, dry, sound-proof, and thermal-insulated structures may be erected of the material.

10. The principal disadvantages attending the use of the material are that a large amount of physical labour is involved in such buildings; those not wishing personally to undertake their erection jobs are likely to find it difficult to secure builders skilled in the use of the material; the low tensile strength requires particular care in securing door and window frames; and additions or alterations in the plan after the work is once started are difficult.

11. The cost of earth wall structures varies widely under different conditions. In this state the complete cost of an adobe residence; including items for all labour, commercial materials and equipment necessary to make the structure available for use is about the same as for a wood frame structure of similar quality. Economies in the cash outlay required may be effected where the builder desires to supervise and do much of the trim and other decorative features frequently employed in residence design.

12. Adobe construction proves attractive to those builders who desire the novel architecure it affords, to those who have a sentimental appreciation of historic methods or desire to erect a structure directly from the soil, to those who desire to ultilize as much of their own labour as possible in the eretion, and to those who desire to combine cheapness and comfort in their houses.

Slaughter of Cattle.

EXTRACT FROM "THE PIONER" JANUARY 27th, 1930.

Raja Raghunandan Prasad moved a resolution that suitable and effective measures be taken to prevent throughout British India the slaughter of milch cows and calves except for strictly religious purposes.

The mover complained that five lakhs of cows were slaughtered in the whole of India every year and three lakhs of them

for the army alone. Thus there was a serious inroad on the country's supply of cows and bullocks.

Sardar Mukhtar Singh urged that efforts be made to improve the quality of cows and organise the dairy industry as had been been done in Denmark.

Sir Frank Noyce opposed the resolution on purely economic grounds. He held that it was not only unpractical but unnecessary as the number of cattle both for draft and dairy purposes was increasing as was shown by the figures available. Further as a result of prohibitive prices only those cows unfit for productive purposes were slaughtered. What India wanted today was not an increase in the number but an improvement in the quality of cattle.

He assured the House that Government were doing all in their power to tackle the problem and urged withdrawal of the resolution."

Pandit Madan Mohan Malaviya, supporting the resolution asked every member of the House how much he owed to the cow as every one took its milk.

Mr. Suhrawardy (interrrupting): But Mr. Gandhi takes only goat's milk.

Pandit Malaviya: If the Hon. Member commenced taking goat's milk he would include that animal in the resolution. Personally for me it is a crime to kill any animal.

Speaking from the economic point of view, Pandit Malaviya asked what India would be if there were no cows. Government had failed to reply to the point that milk was getting dearer in the country, which also accounted for the high infant mortality. Further there had been an immense rise in the price of draft cattle during recent years. There was no greater criminal waste than the slaughter of cattle in the country.

Mr. L. S. Aney held that the question of cow-protection was not merely economic but also religious. What might be a merely useless animal for the non-Hindu, he said, might be an object of veneration for the Hindu, for which he may lay down his life.

Even from the economic point of view the population as well as the cultivated area of the country had gone up in recent years and correspondingly needed a greater cattle supply.

Maulvi Shafii Daudi, opposing the resolution, said that the idea behind the resolution was to prevent cow-slaughter for religious purposes even at the point of the bayonet and he saw no reason why non-Hindus should be compelled to keep useless cows.

Sir D'arcy Lindsay suggested that Government could help in the repatriation of cows, when they had gone dry, to grazing grounds by providing cheaper railway freights.

Dr. A Suhrawardy opposed the resolution on the ground of impracticability. He did not know how to define whether a cow was slaughtered for a religious purpose or a non-religious purpose.

Dr. B. S. Moonji thought the spirit of the resolution was in accord with the position of the Government as both sought to improve the quality of the breed.

Maulvi Sarfaraz Hussian Khan held the problem would be solved if Hindus gave up selling cows to non-Hindus.

Diwan Lalchand Navalrai asked the Government not to take advantage of the thinness of the House to defeat the resolution.

Col. Crawford agreed on the need for an adequate milk and cattle supply for India.

The Rev. J. C. Chatterjee wished the mover had confined his demand to the prevention of export of dry meat to Burma.

Mr. H. P. Mody regretted the acrimonious turn the debate had taken and suggested an amendment urging Government to take such measures as may be practicable to prevent the slaughter of cows.

Raja Raghunandan Prasad accepted the amendment.

Captain Hira Singh, speaking as a farmer, suggested that registers be kept of the superior breeds which should not be slaughtered.

Sir James Crerar (Home Member), replying on behalf of the Government, regretted that both the resolution and the amendment were vague and general, which Goverument were therefore unable to accept. He, however, assured the House that the debate had been very helpful to Government and practical suggestions like cheaper railway freights and repatriation of cows when they became dry to grazing grounds would be given the best consideration by Government.

Raja Raghunandan Prasad made a short reply and the House rejected both the amendment and the resolution by 45 votes to 24 and 47 to 24.

Sayings and who Said them First.

It is easy to attribute any and every wise saying either to Shakespeare or to the Bible; but though a large number of our daily quotations are derived from these authorities, there are many others worth committing to memory which have a different origin.

Thomas Morton, for instance, first asked the question, "What will Mrs. Grundy say?" Thomas Tassar gave us "It's an ill-wind that blows no one any good," "Better late than never", "The stone that is rolling can gather no moss", and "Look ere thou leap". Cowper must be credited with "Variety is the very spice of life", while Bacon recorded the fact that "Knowledge is power." Thomas

a Kempis said, "Man proposes, but God disposes". Keats was the author of "A thing of beauty is a joy for ever" while Franklin wrote "God helps those who help themselves". Campbell is responsible for "Distance lends enchantment to the view", and "Coming events cast their shadows before". Southeren alleged that "Pity's akin to love", and Dean Swift asserted that "Bread is the staff of life". "A fool at forty is a fool indeed," is the trite saying of Edward Young, while Edward Coke, a little-known author, gave us "A man's house is his castle." Matthew Pryor said "Of two evils I have chosen the lesser".

Dryden tells us that "None but the brave deserve the fair". Washington Irving coined the phrase, "The Almighty dollar". "The road to Hell is paved with good intentions", was a current saying recorded by Dr. Johnson. "Out of mind as soon as out of sight," usually misquoted, is attributed to Lord Brooke. Shakespeare was the originator of "better part of valour is discretion", "The course of true love never did run smooth", "Brevity is the soul of wit", "Every why hath a wherefore", "Make a virtue of necessity" and "Screw your courage to the sticking place" (not point). He also gave us the expressions "In my mind's eye", "More in sorrow than in anger", "Every inch a King", "The milk of human kindness", and "A King of shreds and patches". Sir Walter Scott says in Rob-Roy, "There is a good time coming"; it was a taxpayer of 1922 who added, "But it is a good time coming".

Exchange: DAYALBAGH HERALD.
January 1930.

Abstracts and notes on some publications received.

CULTIVATION OF BROOM CORN. BULLETIN NO. 48. S. S. NEHRU, B. Sc. M. PH. D., I. C., S. DEPUTY COMMISSIONER, RAI BARELI. (PRICE AS 5.)

This Bulletin deals with a description of the Broom corn variety of sorghum, its uses and possibilities and the factors affecting the cultivation. In conclusion it is said that the prospects of broomcorn culture in this country are very promising, both for home consumption and for export.

NOTE ON THE REPORT OF THE ROYAL COMMISSION ON AGRICULTURE IN INDIA BY LESLIE C. COLEMAN, M. A., PH. D., DIRECTOR OF AGRICULTURE IN MYSORE.

THE JOURNAL OF MYSORE AGRICULTURAL AND EXPERIMENTAL UNION, VOLS. NO. 1. AND 2.

This note takes into consideration the Report of the Royal Commission on Agriculture, chapter by chapter, makes interesting

potent comments on the report and give a comparative report on the Agriculture of Mysore State.

DOES FARMING PAY?

E. B. HILL AND F.T. RIDDELL in a special Bulletin no. 187 of the Michigan State College, U. S. A. give a business analysis of 114 farms in Michigan. While the analysis is not comparable to conditions in India or on farms in India the general subject matter is of interest and it would be well for Agricultural economists in this country to study same.

REPORT OF THE PROCEEDINGS OF THE AGRICULTURAL EDUCATION COMMITTEE APPOINTED BY THE PUNJAB GOVERNMENT –J927-28.

The following terms of reference indicate the exhaustiveness of the enquiry:—

1. Agriculture in the high and intermediate stages.
2. Agriculture in the middle vernacular schools.
3. Training of teachers and agricultural instructors.
4. Co-ordination between the Departments of Agriculture and Education.

THE APPLICATION OF STATISTICAL METHODS TO SEED TESTING. G. N. COLLINI, CIR, No. 79 U. S. D. A., WASHINGTON, D.C. This Bulletin is a valuable contribution to the literature on the subject of using statistical or biometrical methods in providing measures of accuracy in the testing of biological data. This circular should be in the files of every research worker in this country.

THE COLORABILITY OF GRAPEFRUIT. HENRY C. HENDRICKSON, PORTO RICO EXPERIMENT STATION, MAYAGUEZ. This publication contains an interesting account of the plastid and non-plastid pigments found in grapefruit. A catalase test is also given by which the vegetative vigor of the fruit of different trees may be determined. Oct. 1929.

DIGESTIBILITY TRIALS, AMERICAN AND INDIAN COTTON SEEDS. VOL. X, No. 1, Chemical series, Memoirs of the Department of Agriculture in India. Imperial Institute of Agricultural Research, Pusa.

1. The chemical analysis of American cotton seeds 285F., 289F., and 4F. show them to be richer in fat and protein than Desi cotton seeds.

2. Generally the American cotton seeds sell at a cheaper rate than Desi cotton seeds, therefore it pays to feed them in preference to Desi cotton seeds, the former being more nutritious than the latter.

Digestibility trials, Some Punjab Hays.

Vol. x. no 5. Chemical Series, Memoirs of the Department of Agriculture in India. Imperial Institute of Agricultural Research. Pusa.

1. Four hays were collected from Rawalpindi, Murree, Lahore and Ambala and their respective feeding values determined.

2. A consideration of the daily nitrogen balances reveals the fact that only one hay from Ambala was of a maintenance standard. This hay was mostly from ANJAN grass.

3. The grass hays from Rawalpindi, Murree. and Lahore do not constitute maintenance rations when fed alone.

Abstract : The Newman combined fat extraction, fixing and staining solution for use in the direct microscopic technic for counting bacteria in milk—Report S. Breed, Ph. D. New York.

The above noted method is referred to in a footnote to the Fifth Edition of the Standard Methods of Milk Analysis of the American Public Health Association, 370 Seventh Ave., New York, N. Y. (fifty cents)

The stain recommended is as follows:

Methylene blue powder, certified.	1-1.12 grams.
Ethyl alcohol, 95 percent.	54 cc.
Tetrachlorethane, technical.	40 cc.
Acetic Acid, glacial.	6 cc.

Mr. Newman reports that the method has been used exclusively for two years by California milk inspectors with good results. Dr. Breed agrees that the method simplifies the staining procedure, for the direct microscopic count of bocteria in milk.

KEEPING QUALITY OF BUTTER MADE FROM CREAM OF VARIOUS ACIDITIES.

Abstract from Tech Bul 195, U. S. D. A. Washington, D. C., U. S. A.

The deterioration of butter made from sour cream held at 30 to 50'Fah. was greater than in the case of butter made from cream of less acid content.

Ripening the cream with a lactic acid culture even to low acidities improves the score of the butter when fresh, but the improvements are usually lost during storage.

Butter made from cream of high acidity (0· 31%) may be expected to keep well if stored at a temperature of 0'Fah. or lower

EDITOR'S NOTE.—In India, we may well apply the lesson learnt from the above noted experiments and ripen the cream when the butter is for immediate consumption. Storage of butter under commercial conditions offers an entirely different problem to the one above enumerated.

THE ALLAHABAD FARMER

A quarterly magazine devoted to the extension of Agricultural knowledge in India and the work of the Allahabad Agricultural Institute.

EDITORIAL STAFF.

MANAGING EDITOR, W. J. Hansen, B. S. A., M. Sc.
ASSOCIATE EDITOR, Mrs. M. S. Hatch.
CIRCULATION MANAGER, Graham Matheson, B. Sc.
TREASURER, Mason Vaugh, B. Sc., A. E.

RATES OF SUBSCRIPTION.

FOREIGN, yearly, four issues, 4 shillings or 1 dollar, International money order.

INLAND, yearly, four issues, Rs. 2-0-0.

SINGLE COPY, 8 annas.

AGRICULTURAL INSTITUTE STUDENTS, yearly, Re. 1-0-0.

Applications for specimen copies must always be accompanied with four annas worth postal stamps.

RATES OF ADVERTISING.

Advertising matter will be accepted for insertion at the yearly rates given below:

Full page, Rs. 15-0-0. Half page, Rs. 10 0-0 Quarter page, Rs. 5-0-0.

Advertisements will be published if payment be made in advance by the advertiser, and one copy of the magazine will be supplied to him free.

CONTRIBUTIONS.

This magazine is devoted to the extension of Agricultural knowledge in India. Contributions, either technical or general, are solicited from anyone having the improvement of the Indian peasant at heart. All such contributions should be written legibly on one side of the paper only. Rejected articles will not be returned, unless accompanied with return postage.

Contributors are requested to send in their articles two weeks previous to the prospective date of publication. The magazine will be published in the months of January, April, July, and October, during the first week.

Contributors will receive one copy of the FARMER in which their article appears.

I grow my own!

BEAUTIFUL flowers are one of Nature's decorations and all the ingenuity of man can not equal them. Have your own flowers and give that natural beauty to your home. Include in your garden a small vegetable plot and get the best of fresh vegetables daily at a nominal cost - - - -

FRESH VEGETABLE AND FLOWER SEEDS

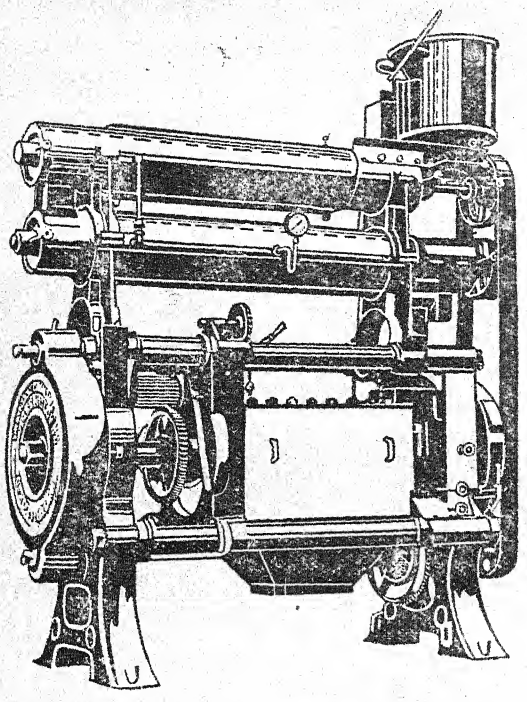
OF

SUPERIOR QUALITY ALWAYS STOCKED.

WRITE FOR FREE ILLUSTRATED CATALOGUE

PESTONJI P. POCHA & SONS

Post Box No. 55, POONA.



FRANS SMULDER'S OIL EXPELLERS

OIL MILL PROFITS CAN BE INCREASED BY INSTALLING **SMULDER'S OIL EXPELLERS.** MILLS WHICH INSTALLED EXPELLERS TO SEE THE RESULTS OBTAINED HAVE VERY SOON, ORDERED MORE OF THEM.

SMULDER'S EXPELLERS ARE IN USE ALL OVER INDIA AND CAN BE SEEN BY INTERESTED PURCHASERS.

WRITE FOR CATALOGUE AND PRICES. DELIVERY FROM STOCK.

Agents :

JESSOP & CO LTD
ENGINEERS

INDIA AND BURMA.

THE ALLAHABAD FARMER

A quarterly Magazine devoted to the extension of Agricultural knowledge in India and published by the Allahabad Agricultural Institute.

CONTENTS :

Vol. 4 JULY, 1930 No. 3

The Mission Press, Allahabad.

AGRICULTURE & CO-OPERATION

Crop Pest Handbook for Behar and Orissa (including also Western Bengal). Second Edition, Royal 8vo. Boards, Rs. 6.
Issued officially by Government, but printed and published by us.

DUBEY.—The Way to Agricultural Progress. Being a Practical Scheme for the Rapid Improvement of the Economic condition of Indian Agriculturists. By DAYA SHANKAR DUBEY, M. A., F.E.S. With a Foreword by Prof. H. STANLEY JEVONS, M. A., B. C. Demy 8vo. Paper. Re. 1.

The great importance of this work is that it indicates clearly the aims and objects of agricultural progress and the general means whereby the State, guided by the people's will, can realize it.

GILLING—Fodder in India. A Treatise on Grasses and Crops and their characteristics and cultivation, etc. By HARRY T. GILLING, Government Grass and Dairy Farms. Crown 8vo. Limp cloth. Re. 1-4 ; Paper, Re. 1.

MUKERJI.—Handbook of Indian Agriculture. By NITYA GOPAL MUKERJI, M. A. Profusely illustrated. Third Edition. Royal 8vo. Cloth. Rs. 12-8.

"a welcome addition to the literature on Indian Agriculture and will doubtless be of great service to those who desire to get within the compass of a single volume of moderate size, a general summary of the plant and animal industries of that vast region."—*Bulletin of Imperial Institute.*

CALVERT.—The Law and Principles of Co-operation. Being the Co-operative Societies Act No. II of 1912. With introduction, notes and an appendix ; and Bombay Act No. VII of 1925. By H. CALVERT, I. C. S. Third Edition. Demy 8vo. Cloth. 1926. Rs. 7-8.

"Mr. Calvert in his book on 'The Law and Principles of Co-operation' with which we have dealt in a previous article, has fulfilled a most useful function in quoting passages from works on 'Practical Banking' and the like. He shows that a Credit Society is a bank in all essentials and that its safety depends on its grasp of the principles of sound banking."—*Civil and Military Gazette.*

In his third edition Mr. Calvert has appended the text of the New Bombay Act, while the special chapters on "What is Co-operation?" and other subjects have all been retained after a revision. These are object lessons in themselves.—*Bombay Co-operative Quarterly.*

There is scarcely any branch of the fascinating subject of co-operation that the author fails to illuminate with some fresh fact or shrewd comment.

MUKHERJEE.—Co-operation and Rural Welfare in India. By B. B. MUKHERJEE, M. A., B. L. Professor of Economics, Government College, Muzaffarpur. Crown 8vo. Paper Boards. Rs. 3.

WOLFF.—Co-operation in India. By HENRY W. WOLFF, late President of the International Co-operative Alliance. Author of "Peoples Books", "Co-operative Banking", etc. etc. Second Edition. Demy 8vo. Cloth, Rs. 8.

The second edition of this valuable work is up to date, for it gives the salient figures relating to co-operation in India up till 1926.

"Mr. Wolff—who, while president of the International Co-operative Alliance played a large part in suggesting the form that legislation might take to facilitate co-operation—describes in 290 pages of this book what co-operation has done and how it is doing it."—*Co-operative News.*

**Complete Catalogues of Books on Agriculture & Co-operation free on Application.*

THACKER SPINK & CO.,

P. O. Box 54 CALCUTTA.

THE ALLAHABAD FARMER

A quarterly magazine devoted to the extension of Agricultural knowledge in India and published by the Allahabad Agricultural Institute.

CONTENTS :

THE
ALLAHABAD FARMER

VOL. IV.] JULY, 1930 [No. 3.

IMPORTANCE OF DAIRYING AS A NATIONAL MOVEMENT IN INDIA.

HERBANS SINGH, I. D. D.

India is predominantly an agricultural country. More than 70 per cent of its people depend directly on agriculture for their maintenance. In the words of Sir John Strachy: "It is probable that 90 per cent of the whole population are so closely connected with the land that they may properly be called agricultural". But unfortunately Indian agriculture has developed itself in such a way that it hardly gives full six months' occupation to a cultivator who has to work fairly hard during the sowing and harvesting seasons, while for the rest of the year has little or practically nothing to do. Mr. Edye, writing of the United Provinces, remarks that "Agriculture of this kind involves very hard work for certain short periods and almost incomplete inactivity for the rest of the year." The work done by an average cultivator in the Punjab, according to Mr. Calvert, does not represent 150 days' full labour for the twelve months.

In a country where such a state of affairs exists, it is not difficult to understand the appalling poverty of the people, 90 per cent of whom have to support themselves for 365 days on their 150 days' labour. No wonder then, an average Indian's annual income comes to be nothing more than 576 annas while in other countries such as the United States of America, it is almost the double number in rupees for the same period.

So in India it is but scandalous to allow such a state to exist any longer and naturally one asks "what subsidiary occupation should a cultivator have to improve his present plight?" That subsidiary occupation to be practicableand helpful must satisfy the following conditions :—

I. It should not hinder their main agricultural operations.

II. It should give occupation right in the villages, because out of the total population of 31,8.,42,480 there live 28,64,76, 205 or nearly 90 per cent in rural tracts,

III. It should be such as to be easily taken up by educated as well as uneducated masses—men and women, so that it may really be called an occupation for all and thus strike at the very root of the un-economical fact that amongst the Indian Agriculturists there are only 45 persons out of 100 who in reality work, to support themselves as well as the rest of the 55.

IV. It should bring cash money, as an average cultivator cannot take to anything which requires a continuous investment with a delayed return.

V. It should be such as to appeal to their general trend of mind and should be acceptable to the majority without any prejudice based upon economical or religious notion.

In the opinion of the writer it is the Dairy Industry which stands all the above tests and even satisfies more to justify its development as a national industry which should be realized as soon as possible if India is to be saved from its imminent wreck—physical as well as economical. **The following are some of the reasons why dairying should be recognized as a national movement in India with all the zeal and encouragement it deserves at the hands of the people as well as the state:**

I. Indian agriculture is so much connected with the bullock, that it is almost impossible to do a single important operation on the farm without its aid. Of course, Indians have realized the value of this animal from times immemorial and there are very sound meanings behind the Indian proverb that: Earth is supported by a bull. Thus the cow has been playing and will continue to play a very important part in Indian cultivation. However, sometimes it is stated, that a first class milch cow cannot produce a first class male calf for draught purposes. But in the writer's opinion, perhaps nobody is in a better position to contradict this statement than Mr. William Smith, the Imperial Dairy Expert, in whose words, "You cannot possibly produce the very best class of draught bullock out of anything but a really good milking cow. The ability to produce milk, Nature's all suitable food is the strongest proof of maternity and the more efficient and perfect the dam, the more vigorous and healthy the offspring." Thus the advancement of dairying means nothing less than an impetus to the betterment of Indian agriculture.

II. There is very favourable scope for the development of the dairy industry in India as yet. Its progress needs two important conditions:

(*a*) Good basic stock to start with.

(*b*) Enough of grazing land to maintain.

As to the first, it is needless to say that India possesses some of the very finest breeds of cattle as yet, though due to lack

of education, unscientific feeding, and indiscriminate breeding, they are deteriorating day by day. So it is high time to stop further degeneration of the Indian cattle, which means nothing less than the degeneration of the Indian nation itself. As to the grazing *land* there is enough in India. It is estimated that for every 100 acres of net area sown there exist 92 acres of available grazing land in British India (including minor administrations.)* Hence if dairying is taken up in the right spirit, every blade of grass on this otherwise almost useless land can be turned into milk—milk which can be rightly called the life and blood of the Indian nation which is predominantly a lacto-vegeterian nation in the very strict sense of the expression. Not a little of appalling infantile mortality amounting to 556 per 1000 of children under one year of age is directly traceable to the inadequate milk supply in Bombay which is estimated to be hardly 3 ozs. per head per day: and what is true of Bombay is true of almost all of the big towns in India.

III. Dairying on right lines will solve to the most extent, the unemployment problem which is getting more acute every day. It will give employment to all kinds of people—educated as well as rural—as it is to be carried on with the co-operation of villagers for the production of milk and urban people for its distribution.

IV. One defect with the present system of agriculture is that the income of an average cultivator is not evenly distributed throughout the twelve months. Thus he receives money in two or three lump sums with the unfortunate result that an average cultivator passes about a couple of months with all the luxuries of an aristocrat, the rest of the ten months he has to look at the door of a money-lender. This sad fact is having a very demoralizing effect upon the agricultural population. In the opinion of the writer, dairying on national lines will help to uplift the cultivator in his moral and social dealings as it will bring to him an even income throughout the year and thus save him from enjoying all the unnecessary comforts and the rest of the period in half starving condition.

V. Indian people—men and women—learn from their very childhood to worship the cow and its progeny. They enjoy a sort of religious satisfaction in the service of the cow. Thus with a very little attempt the masses can be trained to revere the animal on right lines making dairying a success as a national industry. In Atherv Ved it is written

अरभव धर्तारं पयसा
अभि राष्ट्रेण वर्धताम् ।
(Atheru Ved)

* Report of the Royal Agricultural Commission, p. 177.

A cow is the Nation's wealth,
Its milk is the Nation's health.

There are many other popular vernacular sayings in all of the provinces if India, which go to prove that the very psychological inclination of the people is to love and revere the milch cattle. The success of the cooperative system, during the last decade, is a glorious testimony that India is fit for the development of this industry, which requires cooperation at every step and detail of its operation.

VI. Finally dairying will enable the people, the majority of whom are agriculturists, to utilize :

(*a*) Animal dung for maintaining the fertility of land which is every day getting bankrupt, specially in Nitrogen and Phosphates, due to the continuous removal of the nutrients without their adequate restoration to the fields. The cultivator could feed the fodder grown on his farm to the cattle, the manure from which, if carefully preserved and scientifically applied, would greatly enhance the fertility of the soil.

(*c*) With dairying as a subsidiary occupation, the cultivator will have more work to do, which will naturally induce him to take to time-saving improved agricultural implements with the result that automatically the cost of rasing the various crops will be decreased. Thus it will serve as an indirect source of increasing the profits of an average cultivator.

(*d*) If the cultivator takes up mixed farming with dairying as a branch issue, he will not have to be handicapped so much by the irregularities of life

---

POWER FARMING IN INDIA.

Course for Agriculturists.

The Allahabad Agricultural Institute gave from April 9th for the third time a Short Course in Power Farming Machinery and Tractor Driving with a view to ,training young men to use power farming machinery and specially tractors. This short course is given annually during the months of April and May, because at that time fields are available for practice in ploughiug and other operations. This course includes systematic training in the theory and principles of the internal combustion engine, in the care and repair of engines and farm machines, including the dismantling and erection of machines and engines and making

the more commonly needed repairs. The theory and adaptation of the larger power machines are also taken up and attention is given to such machines as chaff cutters, feed grinders, threshing machines and other implements.

Valuable Training.

This course provides excellent training for the zamindar or the agricultural student who expects to work land with tractor power. It is also of value to men who are now employed or so expect to be by firms dealing in power farming machinery. It cannot take the place of a degree course in Agricultural Engineering, but it does give valuable training for men in a field where hitherto little instruction has been available. So far as we know there is no other Agricultural College in India which undertakes to give such training with its own collegiate staff.

Students who had taken this course in the past are now successfully farming their own land with tractor power and acting as representatives of Agricultural Engineering dealers. The number of tractors being sold is rapidly increasing and good salaries are being paid for who men are really capable.

COW SLAUGHTER AND THE INDIAN LEGISLATORS.

H. T. Gogate, I. D. D., Indore.

Raja Raghunandan Prasad moved in the Legislative Assembly that "suitable and effective measures should be taken to prevent throughout India the slaughter of all milch-cows and prime calves except for religious purposes." The honorable member after making the move complained that there was a serious inroad on the country's supply of cows. Pandit Malaviya, a venerable member of the Assembly, in supporting the move said "Milk was getting dearer in the country. This also accounted for the high infant mortality. Further there had been a heavy rise in the price of draught cattle in recent years."

With reference to this move, I make bold to express my humble views frankly. It is now time when we Hindus should face the facts and state the truth.

I quite agree with Pandit Malviya's statement, but if thoughtful readers will think of the causes that are responsible for the dearness of milk, infant mortality and the heavy rise in the price of draught cattle, their angle of vision is sure to be changed. Our cows, which are the objects of veneration for all Hindus, should have been superior to the cows of the other coun-

tries, but unfortunately the case is otherwise. Most of our cows are in extremely poor condition. Hardly five per cent of them could be said to be good cows. So far as the milk quality is concerned, our cows stand last in the world! The way we generally rear our cows, has made them nothing but walking skeletons. Our good looking cows are also nothing but beef-type animals which we Hindus do not need. Moreover, there are but few cows which are capable of returning any profit to their owners. In fact, the condition of our cows is nothing short of deplorable.

Let us turn to the causes of deterioration in our stock. Our stock owners do not know anything about veterinary science and little care is taken to prevent the outbreaks of contagious diseases which greatly reduce the quality of cattle. Bad and immature breeding is the main cause of deterioration in our stock. The general custom in India is that cattle of all ages, including the diseased cattle, are let loose together. Absolutely no care seems to be taken in feeding the stock. Only in the rainy season and a couple of months afterwards, cattle may get enough food, they are practically starving for the remaining six or seven months. It is a known fact, that cows in weak condition and immature heifers mating after a good season of grazing, cannot possibly be able to produce healthy stock as the one is too weak and the other is young and immature and should be building up body and frame instead of procreating. Our cattle breeders do not know the importance of a good line of ancestry. The practice of dedicating young bulls in the memory of some man, does not hold good at all. These young bulls are often allowed to run and mate before they are mature and in 75 per cent of the cases, such bulls are not fit or really worth using as stud bulls. It is this continual, bad, indiscriminate breeding, in addition to bad feeding—paticularly the former—that is responsible for the present degeneration of India's cattle.

The reason why milk is getting dearer is that our cows are becoming poorer milkers. In England, where the living is ten times dearer than in India, milk fetches the same price as it does in India. The reason is quite obvious. The average of excellence of the stock reared there for milk and other purposes, is greatly raised. What accounts for the infant mortality is the fact that no attention is paid to the chemical and bacteriological purity of the milk fed to our infants. There has really been a heavy rise in the price of draught cattle because the difference in the number of cows and bullocks is less. Healthy cows give more calves; consequently, a comparatively smaller number of cows do the work of producing the required number of bullocks.

As for the Raja Raghunandan Prasad's complaint that there is a serious inroad on the country's supply of cows, I should like

to point out that the inroad in India is not less than ten times that in other countries. A study of the cattle problem reveals the fact, that India is not at all lacking in the number of cattle. The census reports of the last thirty years prove, that every year the number of cows is increasing. It is not necessary to worry about the number. What Indian is in need of, is the improved quality of her cattle. Improved cattle give far more return than the cost of food supplied. Bad cows are good for nothing. From the economic point of view, they are a curse to the country. Thousands of cows are maintained in India, simply because our sentiment does not allow us to destroy them. Some millions of cows good for nothing, are maintained in the Gaushalla or Panjrapols, and poor India spends crores of rupees for their feed which could be best utilized in feeding the good animals of the country and thereby solving the fodder problem. According to the Imperial Dairy Expert's calculations (Dairy Journal—Part I—Volume I), India spends about sixty crores of rupees every year for useless cattle, which means, that it is a great economic drain on a country like India.

"Breed the best to the best" is the secret of raising the average excellence of stock. "Like begets like" and if the worst animals are used for breeding purposes, no improvement is possible. India's prosperity lies in eliminating the useless animals. According to my investigations, only those cows, which are unfit for production purposes and those that are cheap, are generally slaughtered. No butcher in India can afford to slaughter a cow which costs more than fifteen rupees. In no other country of the world, is the slaughter of cattle prohibited. People of western countries have been destroying unprofitable cattle and yet the number of cattle in their countries, is more in proportion to the population that in India. In India also, best milch-animals are found in Sindha and the Punjab and the reason is that the Muslims there, do not use bad cattle for breeding purposes.'

Improvement of milch and draught animals is the urgent necessity of India. Western countries have been trying for the last hundred and fifty years to develop the breeds of cattle by judicious breeding, selection and good management and the result is that the average cow yields ten times more milk than the average Indian cow. To be fair, it must be admitted that THE BRITISH GOVERNMENT AND A FEW OTHER RESPONSIBLE BODIES LIKE THE ALLAHABAD AGRICULTURAL INSTITUTE have been regularly contributing towards improvement in this direction. If our legislators want to do some real good about cattle and dairying, there are a good number of ways open to them. The following suggestions, it is hoped, may be of great help to them.

1. Legislators should see that many good bull-breeding

farms are opened by the Government and the public, so that pedigree bulls of good strain will be available to cultivators at moderate prices.

2. They should see that a sufficiently large number of men who know the principles of breeding and who know how to build up good herds are employed by the Government and the Zamindars.

3. Provision should be made for the posts of cattle-inspectors who should always tour in the country to guide the cultivators in cattle-breeding.

4. A Law should be passed prohibiting the use of bulls that are not certified by the cattle-inspectors.

5. In all villages and towns, there should be some responsible person or body to control the mating of cattle.

6. Dedicating bulls unfit for breeding purposes, should be prohibited.

7. Legislators should help the Government in leasing lands at a lower rate of rent for growing fodder-crops and grazing.

8. They should also help the Government in giving greater veterinary facilities to stock-owners.

9. Government should also help in establishing co-operative breeding societies and co-operative dairies to a greater extent.

CO-OPERATIVE SOCIETIES IN THE UNITED PROVINCES

S. H. Freemantle, I. C. S.

(Editor's note: In the following paragraphs the reader is introduced to this valuable work. The complete bulletin may be secured by application to the Superintendent, Government Press, United Provinces, Allahabad).

1. *Introduction.*—The large majority of the people in the United Provinces are agriculturists; they work hard in their fields from morning till night and nature is bountiful, giving them two crops a year; yet they are not able to house, to clothe or even to feed themselves adequately. This state of affairs naturally reacts on their health, and constant illness serves further to impoverish them; and their miserable plight prevents them from educating themselves and thereby learning to discover or to adopt methods for increasing their earning capacity. The agriculturist in fact finds himself in a vicious circle; his poverty prevents him from looking after his health or improving his mind; and his bad health and ignorance help to keep him poor or make

him poorer. Every one realizes that an improvement in his physical, mental and economic condition (his "tan, man, dhan") is essential; but how is this to be effected?

Co-operation supplies the answer to this question. It recognizes that the regeneration and uplift of the people must come not from without but from within; and it attempts to utilize certain inherent moral forces, to attain this object. Co-operation, in fact, tries to better the condition of the people, by means of organized and united action, based on honesty, thrift and self-help. This co-operative idea of joint action is nothing new to India and is particularly suited to the "genius of the people". In ordinary village life co-operation and combination play a considerable part. Cultivators of neighbouring fields constantly co-operate for ploughing and irrigating their land, for cutting of sugarcane and other crops, and for many similar purposes. Co-operation is thus, in a sense, indigenous to the country and Indian peasants can hardly live without co-operating with each other. But their actions are usually sporadic and disjointed, and they do not always realize the importance of loyalty and honesty in their joint dealings with each other. What is wanted, therefore, is a systematized and organized form of co-operation, which could help the villagers to co-operate with each other with greater confidence and in more important ways than they have been doing in the past, so that they may be able to better their own condition.

The actual form that co-operative activity takes, of course, varies according to circumstances and requirements; but usually the problem is first tackled from the economic side; and then advantage is taken of any improvement in the economic condition of the people, for the betterment of their physical and mental condition as well. Institutions for the prevention of waste and encouragement of thrift are the commonest and simplest type of co operative activity; these institutions also aim at supplying money to agriculturists at a reasonable rate of interest or giving them cheaper credit. The methods adopted for this purpose will, therefore, be outlined in some detail in Chapter II.

But co-operation is not merely cheap money-lending, as many people imagine. Cheaper credit is not an end in itself; it is a means to an end. The agriculturist cannot better his condition, unless he utilizes the credit he gets for a productive purpose; he must use the money obtained by him for agricultural improvements, and he must adopt improved methods of cultivation for increasing his income from the land; in other words he must take up better farming. Again, if the agriculturist is not in a position to arrange for the sale of his produce at a reasonable price, all his efforts might be in vain, and others might take the fruit

of his labours ; better business arrangements are, therefore, very necessary. Further, the development of the physical conditions in which he lives, or better living as it is called, would naturally add to his ability to assimilate and apply all useful new knowledge and help to increase his efficiency and his income. In fact, co-operation through cheaper credit is only a step to lead on to co-operation for better farming, for better business, and for better living. These developments of co-operative activity will, therefore, be dealt with briefly in Chapter III.

A movement such as co-operation which aims at the welfare of the people, must have the active support and help of all, officials and non-officials alike. Chapter IV will, therefore, show what steps Government have taken to help in this work, and how other institutions and individuals, official and non-official, can help in furthering co-operation and improving the condition of the people.

2. *The agriculturist and his needs.*—The greatest need of the agriculturist is money ; he must have money for the purchase of seed, of manure, and of bullocks, for paying hired labour, for irrigation and for many other similar expenses. Then again, the zamindar or landowner has to pay a certain sum as land revenue to the Government. In the United Provinces there are some big landlords who own large tracts, but the majority of them only own small fractional shares in villages. These zamindars themselves cultivate only about 20 per cent of the land which they own ; the rest is all let out to tenants who have to pay a fixed annual rent to the landlords. Some of these tenants have occupancy that is hereditary but non-transferable rights, while others are only life tenants. Unfortunately these tenants have in most places to pay, in addition to the recognized rent, various extra sums from time to time, and more particularly if a tenant wishes to extend his cultivation he has often to pay a large sum as *nazrana* for the privilege of being given the extra piece of land to cultivate ; but so great in most cases is the pressure on the soil and hunger for land that even this is usually cheerfully paid, irrespective of the consequences. But the result is that the tenant agriculturist, unless he is an occupancy tenant and has his hereditary fields, incurs a heavy load of debt before he can start any cultivation. If the crops happen to be good, he can manage to pay his rent and gradually to discharge his other liabilities. But if they have been damaged by floods or drought, frost or hail, he may have to borrow even to pay the rent ; and if the rent is not paid by a fixed date, he is liable to be ejected ; so he has got to sell his crops as soon as possible, and cannot afford to hold them up for a better market. Then again, heavy expenses have to be incurred now and again for sickness and for death, for marriages and for pilgrimages. So that however

sparingly the agriculturist—whether a tenant or a petty zamindar—may live, he is almost always heavily in debt, and the rate of interest he has to pay only helps to sink him further in the mire. The usual rate of interest on agricultural loans is half an anna in the rupee per month or 37½% per cent. per year. This rate is increased in the case of some of the poorer cultivators, until sometimes as much as an anna a month is charged. The reason for these high rates of interest lies partly in the necessity of the borrower who has to take the money, no matter what interest may be demanded, and partly inthe inferiority of the security offered. The money-lender fears that in many cases he may lose the principal of his loans, and so attempts to insure himself by obtaining as large a return as possible in the way of interest. Occasionally the money-lender refuses to advance at all except with the proviso of a certain amount of grain being delivered at harvest in addition to the return of his money, or a condition for the sale of produce at a low price is inserted in the bond. In such cases the rate of interest works out to a very high figure, and if the interest is not paid in any one year, it is added to the principal and the borrower sinks further and further into debt. The money-lender who is usually himself an uneducated and short-sighted individual, encourages this tendency towards borrowing; because he thinks he will ultimately either acquire himself by mortgage and sale the property of the small zamindar or be in the position that the tenant cultivates the land, but he himself takes all the produce thereof, thus reducing the agriculturist practically to the position of a serf. On the other hand, however, it cannot be denied that the advantage is not all one-sided; very often the money-lender suffers heavy losses; and on his death his son, unless he happens to be a strong man, finds that he cannot recover even half his dues. But the viciousness of the system lies in the fact that the honest man suffers most, while the dishonest one, who will not repay, stands to gain. Co-operation supplies a remedy for this unfortunate state of affairs, both for the agriculturist and for the money-lender.

3. *A Co-operative Credit Society.*—What the money-lender requires is some security for the return of the money that he lends out and what the agriculturist wants is the supply of the necessary money for his ordinary agricultural needs at a reasonable rate of interest. Now the rate of interest charged on loans varies, as is well known and for reasons which are obvious, in accordance with the security offered by the investment. The security of Government, which controls the revenue of the country, being unquestioned, it is able to borrow money at 4½ to 5 per cent. The large municiplities can obtain loans at 5½ to 6 per cent. They have to pay more because the security they offer is not

quite so good as Government security. A large landowner, borrowing on the security, of his property, can obtain money at 8 or 9 per cent. A smaller zamindari may get loans on the security of his smaller property at 12 to 15 per cent per annum. The substantial cultivator who desires a loan will probably have to pay at least two rupees per month, or 24 per cent. per annum. The ordinary agriculturist has to pay 37½ per cent. or even more.

Now it is clear that, where 10 or 12 men become jointly and severally responsible for a loan, the security that they offer is better than the sum of the securities which each of them could offer, were they to borrow separately. If they borrowed separately, the principal might in one or two cases prove irrecoverable. Where they borrowed jointly, if one borrower fails to pay up the amount of his loan, the creditor can recover from the remainder. Thus if a certain number of men, who know each other, join together and form themselves into an organization called a co-operative credit society, and pledge their joint security, they can obtain credit on more favourable terms than they can obtain singly on the individual security of each. Such an organization or society is registered as a corporate body under the Co-operative Societies Act by the Registrar (an officer appointed by Government for the purpose), and can get cheaper and easier credit; the lender gains, because he has greater security, and the borrower has to pay a lower rate of interest.

Experience, however, shows that the mere provision of cheap credit, unless at the same time the people are educated to a proper knowledge of its use, tends to make them more indebted and is, therefore, of very doubtful benefit. A man who owes Rs. 1,000 at 12½% per cent, is in many ways worse off than one who owes Rs. 500 at 25 per cent, unless he has used the money for a productive purpose. An improvement in the facilities of borrowing is likely to result in grave danger and great waste, if it does not enable the borrowers to discharge their other debts and to save against a rainy day. The second function, therefore, of a co-operative credit society may be said to be the exercise of such control over the loans to its members as may discourage improvident borrowing, while making full provision for real wants. Such a society has also a third function, viz. to teach industrious but improvident persons how, by the exercise of thrift and self-denial and business-like habits, gradually to accumulate capital, sufficient for all the ordinary needs of production. Lastly, the necessity of a spirit of self-help and of mutual help in such a society must never be lost sight of. Co-operative credit is not free and unrestricted credit, but combined and controlled credit which acts as an educative and disciplinary agent. To put it

another way, a true co-operative credit society not only provides cheaper credit, but also aims at encouraging thrift and at preventing improvidence, and exercising control over expenditure. The efficiency of a society may be judged by the extent to which the latter functions are recognized, and by the success which has been obtained in carrying them out.

A credit society, then, is an organized combination or union of individuals, based on honesty, thrift and self-help, for the purpose of improving their economic condition. It aims at supplying money to the members at a cheaper rate of interest than they can get individually. It insists that this money should be taken only for real needs and, preferably, for a productive purpose, and sees that the money so taken is utilized by the borrower for the purpose for which it is given, and it realizes the money promptly when it falls due. In its early days it arranges to borrow money from outside to lend to its members, but its real aim is to encourage thrift among them to such an extent, that they may, in the course of a few years, be enabled to collect their own capital, which could then be lent out to such of them as need it, in accordance with their real requirements. As Luzatti puts it, a credit society has to become the savings bank of the poor for lending to the poor. The borrower himself becomes one of the lenders; he supplies the money he needs to himself at a low rate of interest for a productive purpose, and thereby improves his own condition. The idea is a very attractive one, and so let us now examine the constitution and working of a co-operative credit society in some detail and see how it can perform its main functions and attain its various objects.

FUNDAMENTALS OF INDIAN DAIRYING.

W. J. Hansen, B. S. A., M. Sc.

The other day the following postcard was received: "Dear Sir, I want to start Dairy Farming in India, kindly send me all the necessary information, stamped postcard attached for reply, and for which I shall be grateful and always pray for your long life and happiness." Another man writes that he wishes to start his own Dairy, will it be possible for him to come to the Institute and take a one-week course covering market milk, butter manufacture, cheese making, etc. A school teacher, without any Agricultural experience, writes that he would like to spend his two months' summer vacation at the Institute as a special student, just going around the farm, picking up what he can, so that he may be able to return to his school and teach Agriculture. Some

other enterprising lad writes that as he is without funds and would like to take a course in Dairying, could we give him a freeship, stipend or the like to cover his expenses? Also, occasionally, a student gets the idea that he would like to get some easy money and pleads his poverty. Only a few have been able to stick it out and give some real service in return for the money they get.

Looking over the bulk of the students and visitors to this Institute during the past two years, who have been interested or professed their interest in Agriculture and Dairying, the majority seem to be handicapped by a lack of background, seem to lack inertia for physical effort, and seem to have a prevailing idea that the end result of Education should be to slip them into a soft Government job, with its white collar and pension in their still "young old age." Along with technical education, these are some of the attitudes that have to be educated out of the young men. The old days are gone when a son of a Raja could come to the classroom and twiddle his thumbs while his steno-typist took down the notes. To-day every student pushes his own pen and gets on the business end of a shovel when the occasion demands.

The other day the son of a zamindar, the owner of large fields, came to me and wished to know how he could make Dairying a paying proposition without injuring his conscience by the slaughter of the old and feeble cows. My answer was brief: "It can't be done. It isn't an economical proposition. In your course you will also learn to use the Babcock and Gerber Fat test for milk and milk products. This is the machine, as our worthy Principal has often said, that tells you whether you keep the cow or the cow keeps you. You can keep the cow just as long as your purse and credit can hang together. After that your plight will be as bad as the condition of the poor beasts whose lives you are prolonging."

One morning just following the admission of the new Dairy class, I met them and assigned the work of cleaning out the barns and grooming the animals. The men looked at one another but did not do anything. Finally, one bolder than the rest spoke up: "Sir, I can't do this work. I am a Brahman and this work does not belong to my caste. Further I did not come here to exert myself like this, I came to study." "Well," I said, "don't forget that in your final exam., fifty per cent is given for practical work and fifty per cent is required to pass in this course. We havn't drawn up the work with any idea of making you lose your caste, but have drawn it up with a view to overcoming some of the very noticeable shortcomings and drawbacks that a newcomer possesses. How can you say that you know how to do a thing practically if you have never lifted your hand to the same? This whole farm

is your laboratory, it is for you to discover the secrets of nature: whether in plant or animal by the use of all the senses that you have been endowed with. For you to refuse to work means nothing to me but sorrow that you cannot see your opportunity". With this I left and walked off a distance. The men mulled together and there was heated talking for some minutes. After a while silence, and one of the men approached saying: "Where can we find the buckets, shovels, and brushes?" Today, I am proud of these boys, they know what work means, they enjoy it and they are efficient.

Many of the readers may be prespective Dairymen. For their benefit I will sum up the gist of the principles underlying the foregoing. The first fundamental principle of dairying is that it must be conducted along sound economical principles, for Dairying is a business. The second of the fundamentals is that Dairying means WORK and that Work is Honorable. The third and concluding principle for this instalment is, that success in Dairying depends upon the individual. He must possess the will to succeed and back it up by energy, initiative and judgement.

WHAT CHEMISTRY HAS DONE FOR AGRICULTURE.

M. A. THOMAS

Isabella Thoburn College, Lucknow.

Chemistry, we learn, is that branch of science that deals with all forms of matter, and agriculture is the science, art, and industry of utilising the soil so as to produce the means of human subsistence, embracing, in its widest sense, the rearing of live stock as well as raising crops.

From these definitions we get some idea of what the chief subjects are. On agriculture depends the life of nations, and on chemistry depends agriculture.

"In the days that are forgotten, in the unremembered ages", we find that chemistry had no place in this art of agriculture. In the days of the Pharoahs the land of Egypt had large tracts of land devoted to the raising of crops; the river Nile and canals leading out of it and irrigating the land round about, and of course this land was fertile and yielded large crops, but the method of raising the crops was very crude. Clumsy wooden ploughs were employed to turn the earth, and the clods were levelled by hand with wooden hoes. The seeds were scattered, and pressed into the ground by the feet of sheep which were driven over the fields. The mature crops were cut high up on the stalks

by small sickles, and the wheat or barley, or whatever it was, taken to the threshing floor and there trampled out by oxen. The winnowing was done by the women, who separated the chaff from the grain by tossing it up and catching it again, in a wooden "thali" like platter.

This process seems very crude to us of the twentieth century, but those people knew no better. Their manipulation was crude, and they did not get as abundant a crop as they might have. The cause of this was only discovered about 150 years ago. Certain men settled down to find out what plants required for their growth, where they got these substances from, and in what forms they were obtained.

After a few years these men discovered that there are ten elements necessary for the growth of the plant. These elements are oxygen, hydrogen, carbon, calcium, iron, magnesium, sulphur, potassium, phosphorous and nitrogen. These they discovered by analysis. Further research showed that all except the last three elements were abundant in the soil. These three were needed in large quantities, so for the up keep of their crops farmers would have to supply these artificially.

Liebig worked hard at research work in Germany, and Lawes and Gilbert worked in England. It was these last two who discovered the artificial fertiliser. Plants, we know, get their food from soil, H_2O, and air. "If they get it from air", you might ask, "how is it that they have to be artificially supplied with nitrogen? It is in the air. "That is absolutely correct, but these scientists discovered that plants could not make use of free N_2; they had to take it in the form of nitrates. They knew that bones contain phosphorous, so that if bones were utilized the plant would get its phosphorus; also that in salt mines there are certain waste salts obtained that are rich in potassium, so they could use them as fertilisers; but this problem of N_2 caused a great deal of thought and work till suddenly the pea plant sent a ray of enlightenment. With the help of chemistry these great men discovered that there are certain micro-organisms called bacteria which help in obtaining N_2 for the plant. These bacteria can be divided into four groups. One group break up complex organic matter into NH_3, CO_2, and N_2 which the plant can make use of. Another group build up nitrates and nitrites which the plant uses. Yet another group use the N_2 of the air and "fix" it, so that the plant can use it in that form, and the last group live by symbiosis. These live in the plant, and in return for the food they steal from it, they store up the N_2 found in the pores of the soil, and this the plant uses. As an example of this we can use the pea belonging to the family Leguminosea. Pull up a pea plant, wash its roots, and notice the nodules or swelling on its roots. These con-

tain millions of bacteria which store the N_2, and when the pea plant is cut the roots are left in the soil, so that the next generation of plants can use this N_2. Leguminoseae then is a good rotation crop. Thus far we find that, thanks to chemistry, the deficiency of K, P. and N_2, can be remedied. Chemistry did not stop here, however. It was soon discovered by analysis of rain water, that it contained ammonia in solution, and also CO_2 as H_2CO_3 so that rain water is good for plants, but chemistry also discovered that there are wells that may contain water with a great deal of salts in them. These are not good for the crop, because even 1 to 2 % of these salts will ruin if not kill the plants. So chemists went ahead and by analysis discovered how much of these salts plants could stand.

As time went on it was discovered that certain insects and worms are enemies of crops. So scientists scratched their heads, and ruffled their hair, and the result was—lead arsenate that kills all insects but spares the crops. Also certain compounds containing copper were discovered which killed fungi, and disinfectants were discovered to preserve crops. Then those scientists smiled at each other and combed their hair back to some semblance of tidiness. But they did not stop there and rest on their laurels. They were determined that the crude, clumsy, wooden plough should be done away with, and that sheep should not be driven across fields to press the seeds in, so machinery was invented. This did the work more thoroughly and in less time; winnowing machines saved the ladies from getting sore backs, and the scientists were so pleased. But their troubles were not over.

In every country, horses, cattle, or donkeys are used to drag the machinery, so here came another problem; those animals had to be kept in fine condition to be able to do their strenuous work. Chemists took a hand in the matter, and began analysing their food stuff and saying what they most needed, and how that food should be grown. So that the animals were well fed, did good work, kept good health, and silently thanked the chemists. The scientist, however, soon thought that since he had just given the farmer more crops to grow he ought to do him one more good turn in getting him more good manure. In the olden days farmers knew that animal waste formed good manure, and had used it. At other times chemists had been able to analyse the manure and tell what was deficient and how it could be supplied, so that there was good manure, and rotation of crops, which both encouraged the growth of crops, and also gave abundant crops. Quite recently, one could say very recently, the Activated sludge has come out. This is another way of obtaining good manure. Human waste is taken and air is passed rapidly through it. After a few hours the waste nitrogenous matter is clean and

tain millions of bacteria which store the N_2, and when the pea plant is cut the roots are left in the soil, so that the next generation of plants can use this N_2. Leguminoseae then is a good rotation crop. Thus far we find that, thanks to chemistry, the deficiency of K, P. and N_2, can be remedied. Chemistry did not stop here, however. It was soon discovered by analysis of rain water, that it contained ammonia in solution, and also CO_2 as H_2CO_3 so that rain water is good for plants, but chemistry also discovered that there are wells that may contain water with a great deal of salts in them. These are not good for the crop, because even 1 to 2 % of these salts will ruin if not kill the plants. So chemists went ahead and by analysis discovered how much of these salts plants could stand.

As time went on it was discovered that certain insects and worms are enemies of crops. So scientists scratched their heads, and ruffled their hair, and the result was—lead arsenate that kills all insects but spares the crops. Also certain compounds containing copper were discovered which killed fungi, and disinfectants were discovered to preserve crops. Then those scientists smiled at each other and combed their hair back to some semblance of tidiness. But they did not stop there and rest on their laurels. They were determined that the crude, clumsy, wooden plough should be done away with, and that sheep should not be driven across fields to press the seeds in, so machinery was invented. This did the work more thoroughly and in less time; winnowing machines saved the ladies from getting sore backs, and the scientists were so pleased. But their troubles were not over.

In every country, horses, cattle, or donkeys are used to drag the machinery, so here came another problem; those animals had to be kept in fine condition to be able to do their strenuous work. Chemists took a hand in the matter, and began analysing their food stuff and saying what they most needed, and how that food should be grown. So that the animals were well fed, did good work, kept good health, and silently thanked the chemists. The scientist, however, soon thought that since he had just given the farmer more crops to grow he ought to do him one more good turn in getting him more good manure. In the olden days farmers knew that animal waste formed good manure, and had used it. At other times chemists had been able to analyse the manure and tell what was deficient and how it could be supplied, so that there was good manure, and rotation of crops, which both encouraged the growth of crops, and also gave abundant crops. Quite recently, one could say very recently, the Activated sludge has come out. This is another way of obtaining good manure. Human waste is taken and air is passed rapidly through it. After a few hours the waste nitrogenous matter is clean and

rich in plant food, and naturally forms good manure.

Farmers soon extended their field of activity beyond that of merely raising crops. They made use of that wider sense of agriculture—the rearing of live stock. This rearing of live stock requires a great deal of care and labour, for the live stock is expensive, and its fodder is expensive and the raising of it is laborious, but the profit to the farmer is great. Taking all this into consideration the agriculturalist appealed to the chemist, and again those scientists sat down to think and experiment. They discovered that animals need for their existence, (1) proteins (2) fats and oils, (3) carbohydrates *e. g.* starch, sugar, (4) minerals (5) calcium (6) vitamins. But then there is such a thing as over feeding or giving too much of the same substance, so scientists set about to get the exact amount necessary. They found that growing animals needed calcium most, in order to build up their bones, so they ought to get a fair amount of calcium. Vitamins are obtained from greens, and we all know that animals get those from grass mostly, or whatever green fodder they eat. Minerals they get from water in a dissolved form. So with the help of the chemist's analysis the farmer learnt what to give his live stock in order to build up their systems and keep them fat and healthy. He could fatten cows or sheep for the market, or he could fatten them for the butcher, but he knew how to do it.

Chemistry by this time had become indispensible to agriculturalists and it went further by analysing the diseases of the live stock and finding disinfectants and other chemicals to prevent or cure the live stock. A result of this is best seen in veterinary surgery.

The farmer next discovered what a boon the cow was. He got milk from it, and as a bye-product, butter, cream, cheese. But he found that his cow grew thin and sometimes the milk was not rich. The chemist came to his rescue again. Milk is a complete food in itself, and naturally the production of milk is a great drain on the cow's system. The chemist analysed the milk, found out what it contained, and the proportion of the ingredients. Next he set about finding out the food that would keep the cow in good health as well as help in the production of good milk. Again the farmer was indebted to the chemist. Next the chemist found out how to detect adulteration in milk, or bad butter and such things. He continued his experiments, and soon discovered the means of detecting foreign or mixed substances.

You might ask "what has the chemist done in the manufacture of other products which the nations require?" The chemist has done a great deal even here. From barley he has extracted malt, also that most harmful of drinks alcohol. From corn he has obtained starch, from citrus fruits flavourings used in pud-

dings and cakes, he has shown how fruit can be preserved, and in what substances it can be preserved; he has sterilised tins and coated the insides with a chemical that will preserve the fruit and not make the eating of it give you ptomaine poisoning. He has done very much more than we can see all round us, and which it would take too long to relate.

Thus we find that ever since the chemist took a hand in agriculture it has improved to a very great extent. One of the greatest living authorities on agriculture is Sir John Russell of Rothamstead who was knighted for his brilliant work which helped agriculture so much. Nations are indebted to chemists for their work through the ages, which has enabled the farmer to raise such large crops, to keep then from disease, to preserve fruits, to till his ground and altogether keep the nations alive and healthy. Today we find that chemists have not stopped short at all this work which has been achieved through these last two centuries, but are still to be found investigating, experimenting, analysing in Germany, France, and in the Rothamstead laboratory, etc. and who knows what other wonders they may produce in the coming years?

THE BUFFALO—A DAIRY ANIMAL.

SARDAR SINGH BHATIA.

India is one of the few countries in the world fortunate enough to have been bestowed by nature with this most useful animal for dairying. Every year its value becomes more appreciated.

The Director of Agriculture for the Punjab tells us that this animal thrives when stall fed better than the cow and in tracts where grazing is scarce it is bred instead of the cow. The dairying profits of a buffalo are much greater than those of a cow. I have heard people say that buffaloes are not as heavy milkers as cows and also that they have a longer dry period than cows. Taking the heaviest milking breed of each of the two in India we find that the Murrah occupies the first position among varous buffalo breeds while the Montgomery occupies corresponding piace among the cow breeds.

Now the average milk per lactation of the Murrah buffallo is 4,700 lbs. *i.e.* about 15 lbs. per day while the average milk per lactation of Montgomery is 3,200 lbs. *i.e.* about 12 lbs. per day. Again, the average lactation period of the Murrah buffalo is 314 days while that of a Montgomery cow is 264 days, and calculating by taking up one complete cycle it is proved that an average

Murrah buffalo gives 1·3 lbs. of milk more than the average Montgomery cow*.

An objection raised against the buffalo is that it is expensive to raise. Naturally the animal giving more consumes more. But the ratio between the consumption and production decreases with the increase of the yield or, in other words, it is inversely proportional to it.

Under the Allahabad Agricultural Institute Farm conditions I have calculated that the difference between the feeding costs of a cow and a buffalo is only -1/3 per day. While it should be remembered that an average buffalo gives one half more milk testing 25% higher butter fat than an average cow, and that is why it costs only one rupee and half an anna to produce one pound of buffalo butter and one rupee and five annas to produce one pound butter from cow's milk. Thus the Royal Commission Agricultural Report says, "It is the number of she-buffaloes, not the number of cows, that has to be taken into account when seeking an idea of the milk production".

"As regards male buffaloes used as draught animals, it is sufficient to note that they are every year being pressed into service in greater numbers. Except in the Delhi Division, male buffaloes have for years been employed as the motive power for Persian-wheels. But whereas formerly it was exceptional to find a male buffalo yoked to the plough or used in a cart, it is now an extremely common sight in the central Punjab. They are sluggish, but strong and hardy and compared with the bullock extremely cheap,"†

The idea that the buffalo is a dirty animal is creeping into the ideas of our Indian friends. But it has been frequently seen that whenever the buffalo has been kept under sanitary conditions, it has proved to be more decent and perhaps more fashionable than the cow. If there is any doubt of this fact I invite you to see the herd of the Allahabad Agricultural Institute.

The majority of *gowalas* keep buffaloes and not cows. Let us leave for a moment, all the theories aside and take the case of an ordinary Indian *gowala*. Surely he is not concerned with any scientific theory. He does not know any pedigree sheets. But he knows one thing, and that is that buffaloes are more paying, a fact which he has learnt from his ancestors.

The figures of Poona city given by H.H. Mann, D. Sc. are worth noting here.

---

* Figures are taken from "Manual of Dairy Farming", by G. K. Ghare

† W. C. Renouf, Director of Agriculture, Punjab, writes in the bulletin "Cattle and Dairying in the Punjab".

Table showing the relative proportion of cows and buffaloes in Poona City in 1913.

	Cows		Buffaloes.	
	No.	Percent.	No.	Percent.
Private Owners ..	1126	73·5	406	26·5
Gowalas ..	224	19·75	932	80·25
Total .	1350	..	1338	..

"The Survey of the Madras Dairy trade (1917) shows that 686 registered cattle yards in the city contained 1339 cows and 2988 buffaloes, the number of these kept by private owners being left out of account".

"We cannot afford to neglect the buffalo, it deserves equal treatment with regard to protection against slaughter and improvement in her milking strain by proper breeding as is being given to the cow.

As regards its adaptability I would like to repeat the words of William Smith :—

"Buffaloes have done well in nearly all parts of India and under widely differing climatic conditions." Again he mentions in "World Dairy Congress 1928.

"The total number of cattle in India including Indian States of all classes, ages, and sizes, may be taken as some 182 millions or one for every two persons in the country. Of these there are some 47 million cows and 17 million she-buffaloes. If these animals approached to anything near to the European, American or colonial standard, and if all were of the milking breeds as they ought to be, India would indeed be a land flowing with milk if not with honey".

India can never produce cheaper milk unless more attention is paid to the improvement of Indian cattle, and particularly she-buffaloes, which are mostly neglected at present. It is up to those young men who are studying the cattle problem in the various institutions of the country to improve the breed of cattle and then will they find true progress in Indian dairying.

AGRICULTURAL RESEARCH IN INDIA.

NEED FOR MEN AND MONEY.

Government Co-operation Wanted

The following are excerpts from the Presidential address delivered by Dr. Bhola Nath Singh, Head of the Plant Physiology Section of the Hindu University, at the first meeting of the India Association for the advancement of Agriculture :—

'Since it is customary to deliver an address on such occasions I have selected 'Agricultural Research in India: the task before us and how to take it up' as my subject. I have advisedly chosen this subject for the occasion, as it has of late been engaging the attention of both the Government and the people alike. Our efforts towards the improvement of the agricultural conditions in India have, as expected, failed to yield results of a wide application and therefore call for a revision in our methods of approach. I would suggest that the Indian Universities which are the centres of both instruction and research should now be prepared to come to our help in dealing with this national calamity—I mean the unsatisfactory condition of agriculture in this country.

Most Important Industry.

"Agriculture has been, and will ever remain, the most important industry of India. This country is better suited for the production of a great variety of crops than any other country of the world, since, within its boundaries are realised practically all the conditions of soil and climate which prevail in tropical, sub-tropical and even in temperate regions. Millions of acres of virgin soil have yet to be brought under the plough, while better methods have to be explored to improve the produce of the already cultivated area.

"The conditions existing in India demand united effort on the part of the Universities, agricultural organizations, the State and the people alike for a proper development of agriculture on a sounder basis. In a matter of such vital importance affecting the whole of agricultural India, the co-operation of Indian States can not be over emphasised.

"There is no denying the fact that the need of a proper type of man with high university education and training at research in subjects allied to agriculture, is being recognised and the demand for such workers is steadily increasing. The more the facilities and the larger the number of research centres the greater will be the possibilities of agricultural uplift of India.

Experimental Study.

'Experimental study, if it has to assume the position it has won for itself in other countries in recent years as an instrument for the solution of many vital problems connected with agriculture, must find its proper place in India.

"It has been rightly recognised by the Royal Commission on Agriculture that India is still in her infancy so far as experimental research in agriculture is concerned and that without this no further progress towards the real improvement of Indian agriculture is possible." Their recognition of the value of research on economic lines, in co-operation with the Indian Universities, has ushered in a new era in the history of Indian agriculture. If a modest statement of the opinion of one who has in some measure played the part of a researcher be permissible, it can with confidence be said that, provided the recommendations of the Commission be faithfully and patiently acted upon, a greater agricultural India will before long emerge.

Need of Money.

"It is a pity that more money is not available to the Imperial Council of Agricultural Research, looking to the enormous amount of experimentation that awaits carrying out. This need not be a matter of despair, however, for researches of a wide application are subject to financial limitations everywhere. If, from the many calls on the available funds, those with proven relative importance in the improvement of crop production are rightly discriminated and the funds distributed accordingly, a great deal can be achieved.

"A sharp line of demarcation has been drawn between general and applied research. This has been productive of more harm than good. Applied research is but a part of general research and it will be as difficult to get results of economic value without the aid of general research as trying to get increased yield from the branch of a tree without taking into consideration the working of the root and stem. In order, therefore, to understand more or less complete working of the plant machinery towards certain ends, it is necessary that a free choice be given to the investigator to tackle the main problem from his own angle of vision.

"When such an intellectual freedom has been vouchsafed to the investigator, the next step is to so equip him with such means and facilities as will enable him to immediately bring into execution any side investigation in any branch of the subject which he might be called upon to undertake in the light of the previous results already obtained, as any undue delay, due to lack of such facilities, is bound to damp the enthusiasm of the researcher.

Supply of Workers.

"For an immediate supply of research workers, we must look upon those Universities which have already laid special stress on the applied side of Botany, and which are providing scientific training and carrying on higher research from the point of view of nation building. We must, in the meanwhile, ask for the co-operation of other Universities and Agricultural Institutions in raising the standard of their teaching and so modifying the curriculum as to give the student more scope for the development of the applied side of agriculture and other plant industries. In such a large country as India, in which the problems requiring research in every direction are so numerous, the creation of special institutions to impart the requisite highly technical training of the research type is out of the question. It will, therefore, be well if the existing universities which have attempted to meet this longfelt demand, be financed by the State to enable them to improve their work in this direction.

Help of Universities.

The need for the co-operation of the Indian Universities in the matter of agricultural development has been well emphasised by the Royal Commission on Agriculture. In dealing with this question the Commission observed :—

"Agricultural research is regarded as entirely a matter for the Government agricultural colleges. It should not, in our view, be isolated in this way .... We look forward to a state of affairs in which the Universities will not only initiate agricultural research but will also undertake schemes of research the importance of which is brought to their notice by the Agricultural Department. It will, we fear, be long before the Universities are in a position to take over agricultural research to the extent to which it has been taken over by the Universities in Western countries, but this is the end which should be kept steadily in view and which both the Universities and the Government should endeavour to reach as speedily as possible."

"The next item of direct importance will be the availability of the desired type of worker. Their selection will call for the exercise of a balanced judgment. A foreign degree is not all that will qualify.

Ideal Research Guide.

"The ideal research guide must not only have undergone a training of a very high order, both in the general subjects and in research work, but have himself a fairly long experience of guiding research under Indian conditions. A good deal of failure in agricultural research has been due to the entrusting of this work

to men having absolutely no acquaintance with local conditions. A major portion of their time is thus spent in gaining experience, in learning the language of the agriculturists and getting into touch with the agricultural practice of the area at the cost of real progress in research.

"The provision of a Central Bureau of Agricultural Information is as important as the grant of laboratory and field facilities for conducting research. The importance and the advantages of mutual intercourse between research workers and the agricultural masses can hardly be exaggerated One looks forward to a state of affairs when the custodians of agricultural research in this country will establish such a bureau of information in a University which may be centrally situated and which must of necessity be easily accessible to all parts of India. Our task does not end here. Translating the ideas and the results of experimental research, such as can be put to agricultural practice by the farmers, into languages which can be followed by the people is a matter of vital importance. Demonstration and propaganda must follow research in regular sequence to educate the farmer and make known to him the value of these researches, so that he gets a good return for every pie that he pays as revenue.

"The improvement in the quality of the yield of most of the most important food and money crops should be our objective. At the very outset, I might state that we must substitute detailed examination of a few plants in place of the accepted methods of crop inspection on a large scale.

"It is hardly possible to lay one's finger on the *limiting factor or factors* of crop production by detached experimentation under the varying stress of conditions obtaining in nature, unless work in the field is carried on simultaneously under controlled conditions and a knowledge of the precise effect of individual conditioning factors and their interaction be available. Then and then alone, is it possible to make good the deficit wherever it lies.

"Successful agriculture means the maximum possibilities of plant growth. To meet this end we must, therefore, endeavour to understand the mechanism of growth by quantitative analysis of its magnitude at successive phases of the life-cycle of the plant, estimating that magnitude in term of other cell activities which are believed to be contributory. We may then proceed to trace the graded intensity of the reactions accompanying diverse growth phenomena under differential conditions of external as well as internal factors. Having thus gained an insight into the cell activities and the conditioning factors thereof, we may subject the plant machinery to such physical and chemical stimuli at critical stages of the plant's growth as to induce maximum yield.

Abstracted from "The Pioneer," April 9th, 1930.

THE CRISIS IN WOOL.

DR. RUDOLF A. CLEMEN.

Armour's Livestock Bureau.

Today the price situation in wool is the most serious that it has been during the dozen years since the war. A 65 per cent drop in wool prices has taken place since November, 1924, and during the past year a drop of 30 per cent has brought prices to a bottom level. These prices (tariff removed) are about the same as those prevailing in 1913. The fact that wool prices all over the world today are below the cost of production is a sure forerunner of a decrease in volume and, perhaps in a year or two, of a comparatively scarcity of wool as well as higher prices.

Battle of the Textile Fibres.

The declining trend of wool consumption during the last few years has been due in large part to the competition of other fibres, namely, silk, rayon and cotton. However, the severe competition in the textile industry is not peculiar to it. Inter-industry competition is common everywhere. Again, the competition of various textile fibres is not merely American, but world-wide. There is competition in Lancashire, in Bradford, in Chemnitz, in Lyons, etc. The supply of fibres other than wool has increased considerably and the rising demand has placed them in a more favorable bargaining position than raw wool. The increased competition between these fibres can be seen by a glance at their production figures.

Production of Textile Fibres.

	1920-21	1929-30
Rayon	100,000,000 pounds.	475,000,000 pounds.
Cotton	21,880,000 bales.	29,200,000 bales.
Silk	67,162,000 pounds (1909)	101,852,000 pounds.
Wool	277,905,000 pounds.	353,000,000 pounds.

The situation is that there has been an advance of nearly 30 per cent. in the world ouput of raw wool since 1900. The obvious consequence is that, with world production of all fibres steadily increasing, competition has been tremendously intensified.

What has been the effect of this competition among the fibres? Everyone is aware of the amount of substitution which has taken

place, how woollen yarns have been displaced by yarns made of artificial fibres in the hosiery industry, and how cotton and wool have yielded to silk in the women's apparel industry. Most observers are aware, also, of the influence exerted by the price trend of a particular commodity upon the parallel movements of the other competing commodities. A steady decline in the price of cotton from a 30-cent level in 1923 to an 18-cent level today, therefore, has meant increasing competition for wool. Similarly, a decline in silk from $7.00 to $5.00 has placed it in an excellent bargaining position in relation to raw wool. Finally, a reduction in the price of rayon from $2.50 a pound to $1.15 a pound has enabled the last of the major fibres to compete on more than favourable terms with wool. The potency of these factors make it only a question of time until some such readjustment as is being experienced at present (1930) should take place.

Women's Apparel most Hopeful for Wool.

However, the most important opportunity for the wool industry through aggressive measures, lies in the development of outlets in the women's apparel industry. The cultivation of the possibilities in this industry through vigorous campaigns will not only make woollen fabrics more attractive, but actually more desirable than fabrics made from competing fibres. Such campaigns would do more for wool consumption than any other effort. Especially in certain sections of the country favored by more equable climates, there are endless possibilities for sport costumes of the light-weight jerseys, cashmeres and tweeds. Given style impetus, these fabrics could be adapted for street and day-time wear most successfully. The fashion example of Europe in the wearing of woollen fabrics may well be followed in America and elsewhere. In Paris woollen fabrics are as chic and smart as those of silk or cotton. Both French and English women wear very much more wool than American women. Furthermore, they consider that wool as a fabric belongs in many more types of garments than American women do. Everyone will admit that French women are well dressed and stylish. The fact is that the bias against woollen fabrics on the part of American women is simply an idiosyncracy. It is utterly indefensible on the grounds of comfort or fashion. It can certainly be combated by an intelligently directed educational campaign.

The bias against woollen fabrics in this country may have been accentuated by the purely accidental circumstance that many American buyers in Paris hail from New York City, which is one of the few centres in America where climate does exert somewhat of an influence against woollens. It has been unfortunate for

wool growers that these buyers in Paris have been accustomed to approve designs of certain costumes made in wool by Parisian manufacturers, but have ordered the models made up in silk!

An instance of what might be done by manufacturers of woollen fabrics is the case of the jersey producers. Jersey fabrics are lightweight, easily adaptable to styling, comfortable to wear, and relatively cheap On the basis of these factors, jersey fabrics have become practically a staple in the women's apparel industry. They have shown a steady increase in production over the past five years, and have been one of the strongest forces contributing to the increased loomage of manufacturers producing for the women's apparel industry. Actual figures are not available regarding the extent to which looms are devoted to fabrics for women's apparel today as compared with several years ago, but the increase has probably been appreciable, perhaps as much as 25 to 30 per cent. To this increase, jerseys have probably contributed most, and since they are products that can be fabricated most cheaply by volume methods, the manufacturers of them have reaped greater and greater benefits.

Two other fabrics which have shown an increase in production and consumption, but for which further demand could easily be stimulated, are lightweight cashmeres and tweeds. These fabrics are even more adaptable to styling than jerseys, and can be used for both suits and dresses, alone or in combination with such fabrics as jerseys. Still other fabrics that might be exploited more than they have been are twills and reps, while the recent boom in the knitted woollen industry, and the bright prospects for the future, are too well known to need comment.

The National Wool Marketing Plan.

The need of broader participation in marketing by producers of wool was realized by the Federal Farm Board and action was taken this winter (1929-30) to set up a national marketing plan. It was seen clearly that as long as southern producers at San Angelo, Texas, sold their clip against the Del Rio wool clip, or as long as the state of Texas sold its wool clip against the wool clip of the state of Montana, without a definite orderly method of marketing or a basic price, conditions would continue to be somewhat chaotic. There would be loss all along the line. Producers themselves felt that the present conditions, whereby wool is old in about 60 days' time each year, were old-fashioned. Therefore, the National Wool Council, in consulation with the Federal Farm Board drafted a plan which has resulted in adoption by the majority of wool growers' organizations and in the establishment

of the National Wool Marketing Corporation. It is, as its name implies, a national wool selling company.

It is obvious the *undirected competition* could never give the grower favourable results, but, on the other hand, *co-operation* can scarcely displace *competitive* methods in their entirety. What balance will be struck, is a problem that the future only can solve. The new corporation will undoubtedly help the wool industry forward.

EDITORS NOTE :—The monthly letter to Animal Husbandmen is sent free upon request to Armour's Livestock Bureau, Chicago, Illinois, U. S. A.

BANANA PRODUCTS.

W. B. HAYES, B. S. A., M. S.

many tropical regions, the banana occupies a pre-eminent
n in the economic life of the people. Not only is the ripe
ten, but the green fruit is used as a vegetable; the fruit
l tender white centre of the stalk are also cooked and
the broad leaves are used as plates, the fibre is used as a
cord, or made into mats, and the leaves form an important
for the cattle. In some regions, flour and other products
ade and used. Sir Henry M. Stanley, when he went to
, found that the natives prepared a flour or meal from
s, and soon learned its value as a food, especially during

onditions favourable to the development of banana products
oe divided into two types. One set of conditions is that
d in parts of India, for example, where large numbers of
anas are produced in small gardens and are marketed more or
ss locally. There the price is likely to be low, due to the high
production, and part of the crop could be diverted from the fresh fruit market to the advantage of the grower. The product, being more easily transported would serve to extend the market, and the manufacturing industry would provide part-time occupation in periods of slack employment. An entirely different set of conditions obtains in the banana producing countries of tropical America, where the industry is on a large scale, is highly organized, and depends entirely on the export market. Only uniform bunches are suitable for export, and at present bunches which are under-sized, or which have begun to turn yellow are discarded The economical use of this cull fruit would mean a considerable saving. Investigations of several possibilities are being conducted by the United Fruit Company at this time.

The principal development of the banana products industry seems to have taken place in Jamaica, where it has become of some importance. According to Fawcett, there were 11 factories in operation in Jamaica in 1913, in which year 9,389 packages worth £ 7,808, were exported. Falk and McGuire writing in the American Food Journal for October, 1921, report a factory in Costa Rica capable of dehydrating 4,000 pounds of banana pulp a day.

Banana Flour

When bananas are dried and ground a product is secured which compares favourably in many respects with some of the common flours and meals. This is variously known as banana flour, banana meal, banana powder, pisang starch, plantain flour, and plantain meal. It is ordinarily made from the green fruit, though ripe bananas may also be used. Plantains may also be used, applying that term to those varieties which are edible only after cooking. The peel is removed from the fruit, which is then dried, either in the sun or by artificial heat. Drying under a vacuum is occasionally practised, but it is doubtful whether this is economical, as the green fruit dries readily. The fruit may be dried whole or it may be split or sliced to hasten evaporation. When air-dry, it is ground and sifted, and is then ready for use.

Banana flour has been analyzed by numerous investigators. As different varieties and methods were used in the preparation of the flour, it is natural that the results should vary considerably.

A comparison of banana flour with some other staple foods is given in the following table from Pope's "Banana Culture in Hawaii".

Kind of Food.	Moisture.	Protein.	Fat.	Carbohydrate.	Ash.	Food value per pound Calories.
Banana, fresh ..	73·3	1·3	0·3	22·0	0·8	460
Banana flour ..	9·7	3·1	0·5	84·1	2·6	1610
Wheat flour ..	12·0	11·4	1·0	75·1	0·5	1650
Cornmeal, Bolted ..	12·5	9·2	1·9	75·4	1·0	1655
Potato, White ..	78·3	2·2	0·1	18·4	1·0	385

This shows banana flour to compare favourably in food value with wheat flour. It contains much less protein, but much more mineral matter, as well as more carbohydrate.

Banana flour can be used as a partial substitute for wheat flour in making bread, but this is of little importance except in times of scarcity of wheat, as during the World War. Bread made with 25% banana flour and 75% wheat flour is described in U. S. D. A. Bulletin 701. That made from flour from unripe bananas had a fine texture and appearance, and that from ripe bananas was sweetish, agreeable and required no sugar in its preparation.

However, the main value of banana flour outside the tropics depends on its healthful qualities. It is one of the most easily digested forms of starch, and may be given to invalids and children. It is generally regarded as more palatable than the forms of starch commonly used in such cases. It is particularly valuable in digestive trouble, and has been recommended for children with diarrhœa, by Vipond in American Medicine.

Banana "Figs".

Dried ripe bananas are known as banana figs, because of their resemblance to dried figs. This is especially marked when the bananas are cut into short pieces before drying, and those which are dried whole are sometimes called fig bananas to indicate this difference.

The preparation of the figs has been an industry of some importance in the village of Agashi in Western India for many years. It was described in 1911 by Kulkarni, in the Agricultural Journal of India. The ripe fruit of certain varieties is peeled and spread on mats in the sun, either on the ground or on a platform at a height of ten feet, to protect the fruit from animals. Four days time is required to complete the drying, the fruit being gathered together and covered at night. The bananas become flattened elastic, and sweeter, as well as turning a rather attractive red colour. Banana leaves are used to wrap them for the market. In spite of the crude methods of manufacture and wrapping, the dried fruit is said to remain in good condition for six months. The retail rate was four annas (about nine cents) a pound, and the wholesale rate $3\frac{3}{4}$ annas a pound. The annual production of this one village amounted to about 160 tons, valued at Rs. 27,000, or about $9,800.

Burns and Joshi developed a more sanitary method which is still simple enough for use by the grower or small manufacturer. They constructed a small glass-covered case with holes near the bottom for ventilation, with its legs standing in basins of water to keep out ants. The ripe fruit was peeled and scraped, and placed on a lattice in the case, where it was left four to six days. Each day it was turned, and in the evening the ventilators were

considerable extent. In England, patents have been granted for processes for puffing bananas, and for obtaining pure white cellulose, as well as coloring matter, resins and other by-products, from the stems.

Banana chips, suitable for breakfast food or use in puddings, and "cooking bananas", which are dry and hard, but white, have been produced for the market in Jamaica factories. In Costa Rica the ripe fruit is dried under a vacuum, forming a light colored brittle product which is used in making candy, after grinding, or mixed with milk to form what is called "Banana milk." By using higher temperatures, "banana coffee", said to have a very pleasant flavor, is produced.

A satisfactory jam may be made from banana figs, and these may also be used in making a variety of candies. Candied and glacé bananas are also successfully made.

The United Fruit Company has been interested in developing valuable products, and von Loesecke has reported on two products, vinegar and pectin, on which experiments have been made in the Company's Laboratory. In making vinegar, the pulp and peel of the ripe banana is mashed and pasteurized at 75 degrees for 45 minutes. After cooling it is inoculated with Saccharomyces ellipsoideus and incubated for three days at 20 to 30 degrees C. This mash is then used to inoculate larger batches which are incubated 14 to 20 days. After this the mixture is filter pressed and the filtrate is centrifuged to remove the suspended yeast. The "banana cider" thus formed contains from 6½ to 10% of alcohol and is equal to about 56% of the weight of the fruit. This cider is treated with one-fourth of its volume of strong vinegar, and incubated at 30 degrees for 75 days. The product is treated with 2% of kieselguhr to clarify it, and is then pasteurized at 60 degrees for one minute. The final yield is just over 50% of the fruit used.

Experiments in extracting pectin have not yet been very successful. The pectin content of the peel is from 0.7 to 1.3%, and that of the pulp slightly less. It can be extracted with 2 to 4% citric acid, but the process is rather difficult, and the product has poor keeping quality and a low jellying ability. Further experiments are being made.

Various alcoholic drinks have been made from bananas. Wine for more or less immediate use, is made in some parts of the tropics, and banana flour may be used as a substitute for malt in brewing. It is said that whisky of good quality may be made cheaply from bananas, and that it has the advantage of being ripe in one year. If the commercial use of denatured alcohol increases, as seems probable, it is quite likely that the banana will become an important and economical source of this fuel.

Fibre Chemicals, etc.,

The close relationship between the banana and the Manilla hemp and the fact that banana fibre is commonly used in the tropics, has often suggested the possibility of the commercial production of fibre from the leaves and stalks of the banana. As only one bunch of fruit is produced from each stalk, and the stalk is then cut down, it is seen that tremendous quantities of stalk and leaves are allowed to rot on the ground every year. The fibre is used in India and elsewhere for cordage and mats, but because of the low yield and poor quality of fibre, together with the manurial value of the stems, this is not profitable commercially. The yield of fibre is about 1·44% of the gross weight of the stem. There seems to be more promise in the use of the plant in paper making. This has been done to a slight extent in India. Writers in the Queensland Agricultural Journal say that banana fibre can be used in the manufacture of high grade paper. They state that five tons of stems will produce one ton of pulp, which in 1917 was worth $50. Other writers state that 132 tons of stem are required to yield one ton of paper, and suggest that some means for the mechanical separation of the fibre in the field will have to be developed to make the utilization of stems in this way practicable One method of preparing the pulp which has been used is that of passing the stems and leaves through crushing rollers and then boiling them under a pressure of four or five atmospheres for from three to six hours. Another method of obtaining a fibre suitable for paper stock is electrolyzing the raw fibre in sea water, followed by further disintegration and bleaching.

Anyone who has handled banana plants and and got any juice on his clothing, knows how difficult it is to remove the stain. The sap will dye cloth almost black, and the effect is quite permanent. The tannin contained is the active agent. Various other dyes are made from the different parts of the plant, and the ashes are also used in dyeing in India.

The stalks of the banana contain considerable amounts of potassium, the commercial extraction of which may be feasible. Billings and Christie found that dried banana stems contain as much potash as kanite, and compare favourably with dried kelp as a fertilizer. By charring and bleaching, they obtained 27 pounds of 90% K_2CO_3 per ton. Ellis reports that the dried stalks contain 45·9% of K_2O, and that the dried peels contain 9·05%.

Some investigators have thought that they had found rubber in banana peels, one writer claiming as much as 20%. Others heve reported the presence of oils, but it now seems probable that these investigators have been mistaken. More recent writers report that the substance which had been mistaken for rubber or oil is a chicle-like substance, of which they secured 10% from the latex extracted from green banana peels.

PRUNING OF DECIDUOUS FRUIT TREES.

C. P. Dutt, M. Sc.

Pruning is one of the most necessary orchard operations. Upon it depends the success or failure of orchard management. This is an operation if correctly done which will result in success and if it is incorrectly done then the crop is removed and burned with the brush. Pruning defined is the art and science of removing a portion of a plant to modify the natural habit in order to secure fruit in greater abundance, more regularly, and of better quality than otherwise would be obtained. The object of pruning is five-fold :

1. To produce a vigorous, mechanically strong, healthy tree, free from sunburn, capable of producing heavy crops over a long period.
2. To secure a tree well shaped for convenience and economy is orchard management.
3. To distribute the fruiting area well over the tree.
4. To insure a succession of profitable crops.
5. To secure size and quality of fruit.

Pruning involves six main principles. No one should attempt to prune without knowing them. They are namely :

1. One branch develops at the expense of another. The many branches of a tree are competing for the sap supply. When one is cut back or removed ; the one near it will develop much more, since it is the longest, it therefore will draw and secure a greater amount of material for its development.

2. Pruning weakens a tree. This is partially explained by principle one. That is if a branch is cut back it is weakened. The more one cuts back a branch the more it is weakened. The more branches one cuts back the more a tree is weakened, for these branches are composing the tree. And also by removing a great number of branches the food manufacturing area of the tree is lessened. The roots remaining the same while the top is decreased. This destroys the balance between the food using and food making surface and also between the absorption and evaporation surface. So by pruning severely the tree is weakened severely and when one prunes the tree slightly he weakens it slightly and it is evident that you should prune lightly.

The weakening of the tree is also controlled by the cut that is made. If the branch is cut at a fork it is called thinning and if the cut is made between the crotch and the terminal end of the branch it is called heading back.

The point of the greatest storage of food is in the terminal half of the branch and in heading back the portion containing the greatest food supply is removed. While in the thinning out one

removes the entire branch instead. It is evident that the food bearing tissue is removed much more in heading back than in thinning out. So it is less injurious to the tree if thinning is practised and this should be followed unless the tree is small and it is necessary to shape the tree The branch that is to have the greatest development should be cut the least and the one that is to be checked the most should be cut severely. It follows from this that the lighter a tree is pruned the greater is its development. This has also been shown by experiments conducted by the University of California at Davis. The trees that were pruned severely possessed the least diameter and the least root development. The stumps of the trees were much smaller than those lightly pruned. The development of a lightly pruned tree is more than of a severely pruned tree. The table below contains figures that were taken from the University of California experiments. This shows the difference in the trees lightly pruned and heavily pruned.

Kind of fruit.	Headed and thinned severely.	Headed and thinned moderately.	Only thinned lightly.
	Increase in Circumference in Centimeters.		
Apricot Peach.	11.7	12.6	15.3
	12.0	16.9	19.4

3. Lack of an ideal in pruning results in a great loss. One must have a picture of his ideal tree in mind when pruning. He should know what the tree is going to be like each year for several years to come and must know just what he wants to make out of it. How much he is going to remove each year in pruning.

4. Pruning is a secondary consideration in good orchard management. The water and fertilizers demand greater considerations. One cannot remedy every and all causes by pruning alone.

5. Climate and locality mark the necessity and effect of pruning. One tries to apply one practice to all conditions. This is not right because different degrees of temperature and humidity effect trees differently and the temperature and humidity varies in different localities.

6. Growth habits of varieties differ. Therefore the pruning practice will depend and vary with the amount of wood-growth

produced by the tree during the growing season and on its fruiting habit. An owner can expect a good crop only when he has used the method of pruning applicable to the condition existing in his locality.

Pruning generally speaking means dormant pruning; that is the operation is done during the winter while the tree is in a dormant condition. Pruning is also done during the summer, this is called summer pruning. This is done with the view of increasing fruitfulness in full bearing trees. Summer pruning weakens a tree much greater than dormant pruning. This, however, may be used to good advantage in training young trees by pinching off the tips of the shoots not desired so the growth in the desired branches will be greatly accelerated at the expense of the others.

The pruning practice is divided into two parts. These are pruning proper and training. Training deals with the shaping of the tree while pruning proper deals with the bearing and the health of the tree. Training is practised the most while the tree is young and non-bearing.

The life of a tree is divided into three periods. The formative, transition, and the bearing. The formative period is while the tree is a non-bearing. The transition period is beginning to bear and is changing from non-bearing to full-bearing. The bearing period is from full-bearing to the death of the tree. In this stage it is a mature tree. The pruning practice in each one of these varies a little since one is striving to obtain different things in the different periods.

Beginning with a tree just planted we will now follow the pruning practices that should be applied in the different periods of the life of a tree. At the end of the first growing season in the nursery the tree has reached a balance between the root system and shoot system. The root system is able to supply the shoot system with necessary moisture and salts from the soil. When the tree is removed from the nursery the greatest amount of the root is left in the ground and some are cut off for the convenience of handling, therefore the balance between the root and the shoot systems has been destroyed. So we must restore that balance. This is done by cutting back the top from 20 to 24 inches from the ground. If the tree has small branches on it then three scaffold limbs is all desired. At this time it is important that one should decide what kind of a tree he wants to develop. There are three types of trees :—

1. *The leader or pyramid type.*

In training a tree by this system, the topmost branch is encouraged to gain the dominance and the other branches arise from it. So as time passes the tree becomes pyramid shaped.

2. *The delayed open-center type.*

At the time of the first heading back, the topmost limb is left considerably longer than the other scaffold branches. This results in a strong growth of this limb. Later this limb is cut severely to check it and the remainder of the tree is permitted to thrive at its expense. The object is to obtain a greater spacing of the scaffold branches on the trunk, which is very important.

3. *Open-center type.*

Seventy-five per cent of the deciduous trees in California are of this type. The branches arising from the trunk are given equal encouragement from the first. The centres are kept as open as is possible with freedom from sunburn of the branches. The degree of openness varies with the fruit and local conditions.

The following points should be kept in mind and should be given careful consideration while pruning:—

1. Height of head.
2. Proper dominance of main branches.
3. Avoid sharp crotches.
5. Distance between branches.

If the balance is not restored between the root and shoot systems after transplanting, the tree would be caused to die or make a very feeble start. During the first summer they may be given a light summer pruning by pinching-off the unnecessary branches. This should be done only in the early summer, it is too hazardous in the late summer. Experiments at the University of California at Davis showed that one late summer pruning weakened the trees more than two early summer prunings.

In forming the framework of the tree it should be taken into consideration that plants do not increase in height except through the growth of buds and elongation of the terminal growing point. The height of the main trunk is determined when the tree is cut back at the time of planting. Sufficient trunk space should be left so that at least six or better eight inches will intervene between the main scaffold branches. If a young tree is cut 24 inches from the ground and three main branches are selected, the lowest should be at least 12 inches from the ground. Two main branches should not be kept because there is always danger of splitting. The tree branches selected should be properly balanced around the trunk and form equal angles about 120° each. The primary scaffold branches should be headed at about fifteen to thirty inches or more from their juncture with the trunk. The severity of the first heading depends upon the total wood of new growth, its angle of growth, and the formation of lateral branches on current season's wood. This is true particularly of the peak.

The greater the amount of one year growth the greater it should be cut; being careful that the secondary growth does not come up too high.

The common advice has been to head back the selected shoots severely in order to secure (1) branching. and (2) stockiness. This practice defeats its purpose. If the shoots are headed back to six or eight inches then an attempt is made at the second pruning to secure two branches from each of the three shoots, crowding takes place, and the result is that in nearly all cases only one growth is secured from each of the primary scaffold branches. The University of California at Davis has found that light pruning results in early fruiting, and severe pruning results in late fruiting.

During the formative period one must shape the tree by training and heading back. The heading should not be any more severe than necessary. As the lighter you prune the tree the earlier it will bear. Avoid sharp crotches. Remove all cross and parallel branches not necessary. Retain small spur-like branches for shading the tree branches to prevent sunburn. Make all the cuts clean and use paint to prevent the introduction of fungus diseases.

During the transition period remove all parallel and cross branches. This is the last time for removing any main branhes that are not necessary. This should have been done before this period. Use light thinning and do not prune too severely.

When the trees have reached the bearing period all cross and parallel branches should be kept removed. The pruning should be light thinning for large yields and for the greatest development and health of the tree.

The following steps are recommended in pruning deciduous trees. These steps are for pruning trees during their formative and transition periods :—

1. The nursery trees should be cut at planting at a height of twenty to twenty-four inches above the ground. With many trees the head of many of them may be formed immediately at planting time by making use of side branches formed in the nursery. If these branches are unsuitable they should be removed. The ring of tissue which surrounds the twig at its juncture with the trunk should not be injured. It is this tissue that gives rise to new shoots.

2. The young trees should receive a coat of whitewash soon after planting, to prevent sunburn on the trunk.

3. During April the orchard should be carefully pruned and all undesirable growths pinched back.

4. At the first dormant pruning the trees should be thinned to these branches cut back lightly above the secondary pruning.

The trees should not be cut to stubs unless absolutely necessary. Whenever possible cut to a lateral.

5. During May of the second summer the trees are in the garden all unnecessary growth should be "thinned out". If the trees are making a vigorous growth and the desired spread and number of branches are not sufficient for the ultimate framework, then in addition to the thinning a "heading back" may be given.

6. At the second dormant pruning the tree will need only a thinning out.

7. The same treatment should be given at the third as was given at the second dormant pruning.

ACKNOWLEDGEMENT.

The Editor acknowledges with thanks the following publications received :

Education Monthly; Indian Poultry Gazette; S. M. College Magazine; Lucknow Collegian; Poona Agricultural College Magazine; The Philippine Agriculturist; United Provinces Co-operative Journal; The Kisan Bombay Co-operation Journal; Ohio Agricultural Student; The Poultry World; The Collegian, Benares; The Managra; Hoard's Dairyman; Holstein-Friesian World; Journal of the Central Bureau for Animal Husbandry and Dairying in India; The National Christian Council Review; The Benares Hindu University Magazine; The International Student; The Journal of Dairy Science; The United Church Review; The Rhodesia Agricultural Journal; Breeders' Gazette; Biological Abstracts; Reports of the Imperial Ecomonics Committee; Ewing Christian College Magazine; Memoirs of the Department of Agriculture in India; The Journal of Dairy Research; Publications of the Empire Marketing Board; Bulletins of the U. S. D. A;, Bulletins from State Departments of Agriculture, U. S. A.; Reprints, Imperial Institute of Veterinary Research.

A COMPARISON—EDUCATION IN ENGLAND AND OTHER COUNTRIES.

(Abstract from Convocation Address, Benares Hindu University, delivered by Madan Mohan Malaviya.)

It is an obvious truth that the standard of University education depends directly upon the standard of secondary education. If you wish to raise the former, you must raise the latter. But you can do this only when primary education has been organized on a sufficiently sound and extensive basis. Bearing this in mind, let us recall what the state of education in India is and let us compare it with the systems which obtain in other lands. Let us take the case of England. For sixty years England has sedulously promoted universal education among its people. In 1870 the Elementary Education Act made elementary education compulsory. The Act of 1891 made it free. Since that time elementary education has been both free and compulsory for all boys and girls up to the age of 14. Compulsory education is spilt into three grades: (1) Infant grade, 5 to 8 years; (2) elementary or primary grade, 8 to 11 years, (3) Higher primary grade, which is sometimes called secondary education, 11 to 14 years. The secondary schools prepare students for the University matriculation examination, and encourage them by special grants to continue their studies for special courses. There are 60 public schools which are regarded as of the first rank, which have a reputation for building up character and preparing young men for administrative appointments. There are over a thousand other secondary schools. Since the War a new type of school called the Central Schools has come into existence. They take in boys and girls at the age of 11, on the result of a competitive examination, and impart free instruction. They are day schools. They divide their courses in groups; the commercial group, the technical group and the industrial group. The present-day tendency in England is to include technical subjects in the scope of general education and to obliterate the distinction between primary, secondary and technical schools. But there is at present a net-work of part-time, whole-time and evening schools and technical schools, and there are technical colleges for advanced technology. In these schools a variety of technical and professional courses are offered to suit the particular bent of each student. In addition to these there are polytechnics which prepare the lower middle and the working classes for various industries and trade which require skilled labour. They offer training in every industry which exists in the locality. There are also technical institutes which offer teaching in specialised

subjects. Polytechnics also provide teaching in ordinary arts and sciences for university degrees. On the top of these institutions, stand the Universities of which there are 16 in number.* A large number of scholarships is given in secondary schools to encourage promising pupils to prepare themselves to join the Universities. It will be evident from this how much care is taken in England to see that every child receives the education for which he is naturally fitted. In all important countries of the West similar steps have been taken, and the systems of primary and secondary education have been overhauled, enriched and put on a sound footing.

Vocational Guidance

Let me give you some idea of the provisions that have been made in the last ten years in those countries to help the youth and the cause of education. Having improved their respective systems of primary, seeondary and technical education they have introduced a system of vocational guidance, which has been defined as "the giving of information, experience and advice in regard to choosing an occupation, preparing for it, entering it, and progressing in it". They have created Committees of School Masters and others, and Juvenile Employment Exchanges and Bureaus to advise boys and girls after they leave the school as to the career they should enter upon. They do not think that they have discharged their duty to the child when they have passed him through the school. In all these countries the interest in the child has been extended to preparing him for occupational life and to securing him employment which may be suitable to him. Thus in Austria, in 1922, an order of the State Education Office stated: "It is the duty of the School not only to provide suitable instruction and education for the children who attend it, but also to advise parents as to the future careers of their children and as to the choice of an occupation". A French writer, F. Buisson, quoted by Prof. Shields in his book on the "Evolution of Industrial Organisations" wrote in 1921: "The school is not made for the school, but for life. It must provide the society of the future with men. It is a cruel mockery suddenly to abandon its little pupils on the day they reach their thirteenth year, when they are flung unarmed into the battle of life. It is also the most foolish waste. What madness, having done so much for the school boy, to do nothing for the apprentice! From this has arisen the idea, which has rapidly spread, that the social functions of the school must be greatly extended. There are many new services which it must

* I have taken much of this information from my friend, Dr. Ziauddin Ahmad's valuable publication on SYSTEMS OF EDUCATION.

give. The first of these is the supervision of the transition from the school room to the workshop". In England and Wales, vacational guidance has been provided for since the Education (Choice of Employmen) Act was passed in 1910 for giving advice to boys and girls under the age of 17 (extended to 18 by the Education Act, 1918) with respect to the choice of suitable employment. So also in the Irish Free State, in France, in Belgium, in Germany, and in the United States, where probably the first systematic attempt to provide vocational guidance was undertaken in 1907.

This will give you some idea of the amount of care which is bestowed in England and in other civilised countries on the proper education of the child. Every civilised Government regards it as its duty to educate the child, and to educate him in such a manner that he should be able to earn a suitable living. During the ten years since the War every civilised country has endeavoured to give a more practical bias to education. After six years of experiment Austria-Vienna in 1927 completely re-organized its school system. By 1928 Chile had reduced illiteracy to less than 30 per cent of the population of four and a half millions, and nearly one seventh were at educational institutions of some kind. Vocational training has been introduced in the third year of the secondary school, and experimental schools and courses have been established and a system of model schools is to be created to determine the type best suited to Chile. In Hamburg schools are being turned into community centres, parents' co-operation enlisted, and self-Government employed. The aim of present Swedish Education is to fit young people for citizenship and to develop their whole personality. In 1918 a whole system of practical education for young people was created and is vigorously at work. In Turkey since the War the old system of religious schools has been discontinued, and a democratic, secular, modern and national system of education has been put into practice to fit the country's new conditions. The number of schools has been largely increased, all education made free, opportunity for self-government given everywhere, and the activity plan put in operation into the first three years of elementary school. It is hardly necessary for me to remind you of the progress of education in France and Germany, America and Japan. The progress of their commerce and industries, the prosperity, power and happiness which they enjoy is in the largest measure due to the education which they have imparted to their sons and daughters during the last fifty years and more.

Education in India.

Let us turn now to our own country. What do we find here? As has well been pointed out by a distinguished English scholar, there is no country where the love of learning had so early an origin or has exercised so powerful an influence as India. Yet after nearly a hundred and seventy years of British rule, India is still steeped in ignorance. According to official reports the percentage of literates of both sexes and all ages was only 7.2 in 1921. In 1927 only 6.91 per cent. of the male population and only 1.4 per cent. of the female population were at school. The total attendance in all the schools and colleges in India in 1921-22 was 7½ millon. Of this about 5 million were in the first class (including the infant class) of the primary schools, and the remaining one-third was distributed among the remaining three classes of the primary schools and among all the other educational institutions including Universities and Colleges. The majority of the boys drop off in the first class and only 19 per cent of those who join the first class of Primary Schools actually reach the fourth class. Children in the first class cannot read and write and the little they learn is soon forgotten. There is a loud wail in a recent official report that the wastage and stagnation which these figures reveal are appalling.

Where provision for primary education is so utterly inadequate, it would be unwise to expect any system of night schools or continuation schools for adult education.

Secondary schools also are inadequate in number and poor in the quality of education they impart. The standard or general education they provide is much below that which obtains in other countries and which is needed to give the education a practical value. They are also deficient in that they offer only a general and not vocational education. There are a few agricultural, commercial, technical and industrial schools. They are poor both in number and quality. We look in vain for alternative groups of courses in agriculture, commerce and industry such as the Central Schools in England provide. The official report, to which I have referred, says with regard to secondary schools: "The immense number of failures at matriculation and in the university examinations indicates a general waste of effort. Such attempts as have been made to provide vocational and industrial training have little contact with the educational system and are therefore largely infructuous".

Universities may be likened unto trees the roots of which lie deep in the primary schools, and which derive their sap and strength through the secondary schools. Where both are woefully deficient and defective, where there is no diverting of students to vocational courses, where, speaking generally, every student is

forced to adopt one general course which leaves him unfit for anything except clerical service of a very poor kind, it is not surprising that Universities have been hampered in their work by admitting students who are not fitted by capacity for University education, and of whom many would be far more likely to succeed in other careers. In the circumstances that obtain at present, Universities cannot be expected to secure and maintain such a general high standard as they would naturally desire to. Indeed, it is a wonder that with all the handicaps under whlch they have laboured they have been able to show such good results as they have shown. It is clear, therefore, that for bringing about much-needed improvement in University standards of admission, teaching and examination, *a national system of universal compulsory and free primary education and a sound system of secondary education, with attractive vocational courses must be adopted.* This way lies the remedy for the present unsatisfactory state of things and not in proposals for leaving out in the cold students who are not gifted or have not been fitted by proper school instruction for University education.

RELATION OF STOMATAL BEHAVIOUR TO STEM-RUST RESISTANCE IN WHEAT.

HELEN HART. REPRINTED FROM JOURNAL OF AGRICULTURAL RESEARCH, WASHINGTON, D. C.

Summary:—Two kinds of resistance to stem rust have been dmeonstrated previously: physiological resistance and morphological resistance. To these may be added a third kind, termed "functional resistance."

Some varieties of wheat are resistant to stem rust in the field because of the behavior of their stomata. Such varieties may be susceptible to stem rust in the seedling stages of their development.

Stomatal movements of wheat follow a definite daily rhythm. Stomatal movements differ considerably in different varieties of wheat. Stomata of some varieties open very soon after sunrise aud usually remain open most of the day. Stomata of other varieties open very slowly and remain open only a short time. There also are varieties with an intermediate type of stomatal behaviour.

Stomata of the younger and more succulent plant parts open sooner and remain open longer than stomata on older or less succulent parts. Stomata on the young wheat leaves open sooner than most of the stomata on the older leaves, on the sheath and on the peduncle of the plant.

The critical period for stem-rust infection is in the early morning immediately after sunrise and while the plants are heavy with dew. The fungus easily enters its host if the stomata are open during most of the critical period, but if they are closed during that time the fungus is excluded. There are great differences in the stomatal behaviour of some wheat varieties during this critical period.

Direct sunlight seems to be the most important stimulus for the opening of stomata of cereals

Artificial light, excess of moisture, and excess of moisture and temperature combined did not prolong the period of openness for stomata of cereals in the greenhouse.

From inoculation and histiological studies it appears that the stem-rust germ tubes generally, and probably always, enter the host only when the stomata are open. The fungus does not seem to force its way through closed stomata.

A variety of wheat may appear truly resistant to stem-rust if the behavior of its stomata is such that most of the inoculum is excluded and rendered ineffective.

There is a correlation between stomatal behaviour and the resistance of certain varieties of wheat to stem-rust in the field at University Farm, St. Paul. Stomata of the highly susceptible varieties, little Club, Baart (Early Baart), Quality, and Reward, open soon after sunrise and remain open most of the day. Stomata of some slightly less susceptible varieties, Marquis Ruby, Haynes, Bluestem, Aranautka and Mindum, open a little more slowly after sunrise, but they too remain open most of the day. In the varieties which are highly resistant in the field, Hope, Webster, Acme, and Velvet Don, the stomata open very slowly and close again relatively early in the day. Varieties which are moderately resistant in the field, Kota and Kubanka, have an intermediate type of stomatal behaviour.

The Mission Press, Allahabad.

THE ALLAHABAD FARMER

A quarterly magazine devoted to the extension of Agricultural knowledge in India and the work of the Allahabad Agricultural Institute.

EDITOR AL STAFF:

MANAGING EDITOR, W. J. Hansen, B. S. A., M. Sc.
ASSOCIATE EDITOR, Mrs. M. S. Hatch.
CIRCULATION MANAGER, Graham Matheson, B. Sc.
TREASURER, Mason Vaugh, B. Sc., A. E.

RATES OF SUBSCRIPTION.

FOREIGN, yearly, four issues, 4 shillings or 1 dollar, International money order.

INLAND, yearly, four issues, Rs. 2-0-0.

SINGLE COPY, 8 annas.

AGRICULTURAL INSTITUTE STUDENTS, yearly, Re. 1-0-0.

Applications for specimen copies must always be accompanied with four annas worth postal stamps.

RATES OF ADVERTISING.

Advertising matter will be accepted for insertion at the yearly rates given below:

Full page, Rs. 15-0-0. Half page, Rs. 10-0-0 Quarter page, Rs. 5-0-0.

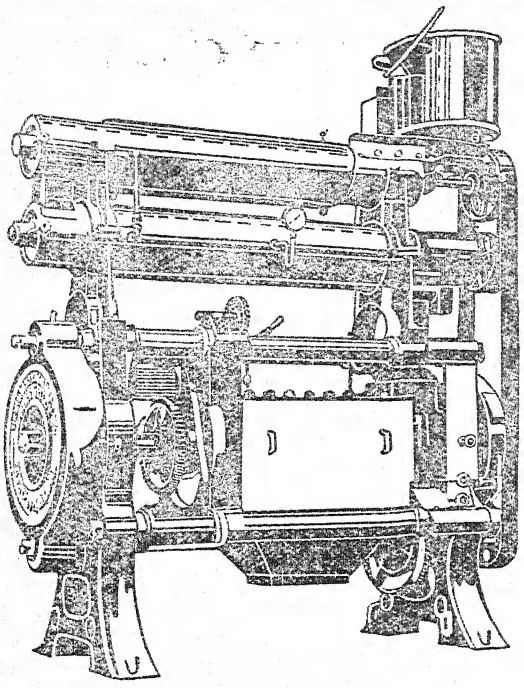
Advertisements will be published if payment be made in advance by the advertiser, and one copy of the magazine will be supplied to him free.

CONTRIBUTIONS.

This magazine is devoted to the extension of Agricultural knowledge in India. Contributions, either technical or general, are solicited from anyone having the improvement of the Indian peasant at heart. All such contributions should be written legibly on one side of the paper only. Rejected articles will not be returned, unless accompanied with return postage.

Contributors are requested to send in their articles two weeks previous to the prospective date of publication. The magazine will be published in the months of January, April, July, and October, during the first week.

Contributors will receive one copy of the FARMER in which their article appears.



FRANS SMULDER'S OIL EXPELLERS

OIL MILL PROFITS CAN BE INCREASED BY INSTALLING **SMULDER'S OIL EXPELLERS.** MILLS WHICH INSTALLED EXPELLERS TO SEE THE RESULTS OBTAINED HAVE VERY SOON, ORDERED MORE OF THEM.

SMULDER'S EXPELLERS ARE IN USE ALL OVER INDIA AND CAN BE SEEN BY INTERESTED PURCHASERS.

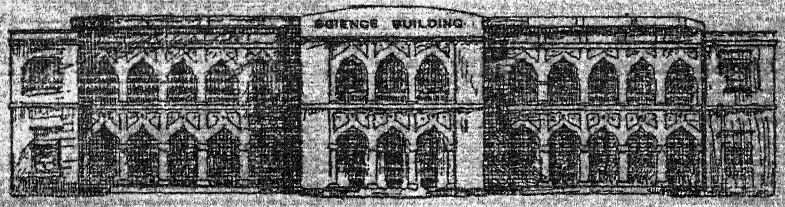
WRITE FOR CATALOGUE AND PRICES. DELIVERY FROM STOCK.

Agents :

JESSOP & CO LTD
ENGINEERS

INDIA AND BURMA.

THE ALLAHABAD FARMER



PUBLISHED QUARTERLY

Undenominational in Scope and Interests.

Vol. IV **OCTOBER, 1930** **No. 4**

CONTENTS :

Editor : W. J. HANSEN, B. S. A., M. Sc.

Published by : The Agricultural Institute, Allahabad, U. P. India.
American Presbyterian Mission.

Annual Subscription : Including Postage, in India, Rupees 2.

Annual Subscription : For other countries, $1-00 or 4sh. Special rates for Students.

Advertising Rates : Upon Application.

The Mission Press, Allahabad.

THE
ALLAHABAD FARMER

VOL. IV.] OCTOBER, 1930 [No. 4

IF

If you can keep your head when all about you
Are losing theirs and blaming it on you,
If you can trust yourself when all men doubt you,
But make allowance for their doubting too,
If you can wait and not be tired by waiting
Or being lied about don't deal in lies,
Or being hated don't give way to hating,
And you don't look too good, nor talk too wise ;

If you can dream—and not make dreams your master,
If you can think—and not make thoughts your aim,
If you can meet with Triumph and Disaster
And treat those two imposters just the same ;
If you can bear to hear the truth you've spoken
Twisted by knaves to make a trap for fools,
Or watch the things you gave your life to, broken,
And stoop and build'em up with worn-out tools :

If you can make one heap of all your winnings
And risk it at one turn of pitch and toss,
And lose, and start again at your beginnings
And never breathe a word about your loss ;
If you can force your heart and nerve and sinew,
To serve your turn long after they are gone,
And so hold on when there is nothing in you
Except the will which says to them ; " Hold on ! "

If you can talk with crowds and keep your virtue,
Or walk with kings—nor lose the common touch ;
If neither foes nor loving friends can hurt you ;
If all men count with you but none too much,
If you can fill the unforgiving minute
With sixty seconds' worth of distance run,
Yours is the Earth and everything that's in it,
And (which is more)—you'll be a Man, my son !

RUDYARD KIPLING.

THE PRINCIPLE OF CO-OPERATION.*

SIR RABINDRA NATH TAGORE.

In certain stages of civilisation, cities automatically become more important than villages. Not that a nation's life blooms brighter in a city; its power is better organised there and that is what it glories in.

Sociability which is the essence of a human community can never crystallize in cities. For one thing, the greater magnitude of a city tends to make the social tie rather loose-knit, and for another, the satisfaction of material needs rather than a realisation of human values is the pre-occupation of the huge crowds who are brought together in a city by the urge of commerce and trade, and the lure of its many facilities.

Thus, not knowing his neighbours is no discredit to a city-dweller. As life becomes increasingly more complex the gulf that divides one individual human being from another tends to become ever wider. I remember to have seen in my childhood our nighbours mixing freely with our family. They came to our pond for bathing and to our garden for air, where there was nothing to prevent them from plucking flowers for daily worship. They would take their seat in our verandah and demand a whiff of tobacco-smoke without the least hesitation. They felt they had the right to help and participate in the ceremonial dinners and festive occasions of our family. Buildings of those days had halls opening on to a number of courtyards. This arrangement not only facilitated the passage of light and air, but also made for the free access of people in general. In the midst of their own necessities, men had to make room for others needs : one was not to use one's entire wealth exclusively for one's own enjoyment. A rich man's storehouse had two entrances, one for himself and the other for society. *His fortune was inextricably bound up with the fortunes of those round him.* A ceremony was merely an occasion for acknowledging every body – uninvited—as a member of one's own household.

This shows that in point of social character our towns greatly resembled our villages even in the recent past and whatever difference there was, was more in appearence than in reality. Beyond all doubt, our ancient cities must have been of this class. In spite of their civic pride, they acknowledgd their kinship with villages. It was more or less like the outer and inner sections of an aristocratic household, wealth and show in the outer, leisure and comfort in the inner ; with an open door of cordial relationship between the two.

*United Provinces Co-operative Journal, Volume 6. No. 4.
Bengal Co-operative Journal, Volume 15, No. 2.

That things are far otherwise now is quite apparent, within the last fifty years, almost before our eyes, cities have become exclusively cities with even their backdoors barred against all communication with villages. This is what may be called "making a strange land of one's own courtyard." All about a city, so close to it, the villages are still there, but yet how far apart!

This unnatural discord can never be for the good of man. It needs pointing out that this is by no means a feature peculiar to our country in the present times; it is the common denominator of the modern age all the world over. In fact, germs of this social antagonism, carried by Western winds, have been scattered all over the world, not only endangering the peace and happiness of mankind, but threatening to destroy life at its very source. And the whole world is face to face with this problem today.

Civilisation, as conceived in the West, means the sapping of the common life to concentrate on certain special functions—like the flowering of the bamboo which exhausts its entire vital force. Specialisation, in course of its growth, becomes lop-sided, its accentric weight cracks the whole edifice with the inevitable consequence of a final crash. Europe reveals her cracks in her various social disturbances. The Ku-Klux-Klan, Bolshevism, Fascism, the Labour revolt, sex-rebellion,—these movements are indications of the loosening of the social bund in European life.

Modern civilisation is based on exploitation.—The minority exploite the majority that it may prosper like a parasite. A privileged few are inflated at the expense of the countless many who eke out a miserable, starved existence. The inevitable result is a sharpening of the sense of self-interest which is utterly unsocial.

I have already said that cities are the centres of power in a land, and villages are its centre of life. For the exercise of political, economic or democratic power, special conditions and regulations are necessary. *The conditions are anti-social and the regulations are dominated by a mechanistic rather than a humanistic, principle.* Power comes to him who can obtain control of this mechanical arrangement. For this reason, a city, generally, is a field of competition where co-operative tendencies cannot be properly encouraged and fostered.

Self-interest and competition are necessary for the growth of power. But they become fatal as soon as they overstep their proper limits. In modern civilisation these limits have been left far behind. The civilisation of today is many limbed, and so a huge preparation, involving expenditure of money on a lavish scale, is necessary to keep it alive and going. Based as it is on an immensity of materials, thinness of resources is almost a crime to it, and material poverty is its greatest obstacle. Learning and

health, recreation and roads, courts and conveyances, food and furniture, war and peace—everything is prohibitively costly. The poor are constantly insulted by it as poverty constantly impedes its progress.

Wealth, therefore, is the source of all influence and hence most coveted. In fact, modern diplomacy is actuated not by prospects of political domination but a hankering after commercial expansion for the accumulation of wealth. In olden days when civilisation was less complex, the learned, the cultured, the heroic, the charitable, the illustrious received a homage which the merely rich could never aspire to and true human worth was thus accorded an honour that was its due. For the money grabber, there was only popular contempt. But modern civilisation is a parasite on wealth. *So wealth is not merely sought, it is worshipped.* All the world over we find evidence of the fact that the worship of false gods destroys the good sense of man. Never before has man been so intensely inimical to man, because there is no passion so cruel and unjust as greed. The motive power of modern civilisation is greed and preparations for its satisfaction far outstrip any other form of human activity.

But there is no getting away from the bitter truth that greed leads to sin and sin to death. As a disruptive tendency, greed serves to weaken the social tie, and brings in its train a series of discords and a restlessness that can never be cured, leading finally to a division and dissolution of social integrity.

An interminable conflict between the possessors and producers of wealth is raging in the West today. Reconciliation seems to be an impossibility, for the greed of the man who supplies wealth is not a whit less than the greed of him who accumulates. Both feel the imperative need of abundant spare money for a satisfactory enjoyment of civilised life. Such being the case, a definite conclusion of this economic tussle is more than what can be reasonably expected.

In a society in which the urge of greed and the adoration of power assume dangerous proportions—whatever may be the reasons,—man's mind is turned away from the path that leads to an all-round self-realisation. He desires to be strong rather than self-complete. This is a state of things which greatly promotes the preponderance of cities to the utter neglect of villages. All comfort, all convenience, all manner of enjoyment are concentrated in cities. The sole function of villages is to provide cities with sustenance and in return for this slave-like service, they are suffered to lead a mean and subordinate existence. Society is thus sundered into two sharply-contrasted sections of light and darkness. The city-bred civilisation of Europe thus also divides individual wholeness. Ancient Greek civilisation was fostered

mainly in the cities, and on account of the wide gulf between masters and helots, it declined after a brief period of splendid efflorescense. Ancient Italy was essentially urban and she vehemently pursued power for a time. Power is by nature anti-social, creating as it does a sharp division between the possessors of power and their agents. Thus a limited number of men—as masters—live like parasites on a large number of men who are no better than slaves, and parasitism saps the foundation of all human values.

The Western nations, under the urge of their city-bred civilisation, are dividing human society into two anti-thetical sections of light and darkness, not only at home but all over the globe. The extent of their desires are so vast that it is impossible to meet them within their rightful jurisdictions. Englishmen have to exploit India to maintain that costly standard of living which is supposed to be indispensable to civilisation. To relinquish India means lowering the standard of their pampered line civilisation. England is in indispensable need of subject-nations for the realisation of the power she aims at. This explains why the British like parasites on India today. This also explains why the major powers of Europe are eager to parcel out Asia and Africa among themselves. Otherwise their overfed civilisation will have to starve. The parasitism of the minority on the majority in Europe itself is due to the same reasons. The means to excessive enjoyment cannot be equally distributed amongst all; if the few are to be inordinately rich, the many must be deprived of their dues. This problem in its most aggressive form offers itself for solution in modern Europe. At the root of the conflict between labour and capital lies the organised longing of both for unrestrained enjoyment. It has created as great a difference between capitalists and workers as between the ruling nations and the ruled. Such extreme inequality is in conflict with the noblest ideals of humanity. Destructive forces generate and gather openly or in secret, wherever human unity is thus threatened. So a master may openly injure the slave, but the slave, in annihilating his sense of truth and justice, strikes, indirectly, a more fatal blow. For physical want may kill the brute: it is spiritual bankruptcy that leads to the downfall of man.

The arrow that killed the one-eyed deer of Æsop's Fables was shot from the direction in which it had turned its blind eye. The aspect of acquisitive materialism is the blind side of modern civilisation. Curiously enough, inspite of this ruthless competition in the economic sphere, we find in Europe in its intellectual field a vast and varied co-operation. In consequence, the lamp of European intellect, burning in a thousand flames, has cast a dazzling brilliance on the modern age. Through her culture,

Europe now leads the other continents. Her peoples are the priests in the cultural situation of today, and the fuel they have gathered from all quarters for the sacred fire is so immense in quantity that the fire promises to burn for ever. Never before in the history of mankind has cultural co-operation been practised on such an extensive scale. Formerly, nations used to evolve their own cultures, each independently of the rest. Greek, Latin, Indian, Chinese, all these different cultures bear out the fact. Fortunately, the countries of Europe are of close contiguity; their natural barriers are not insuperable; they are not sundered by far-stretching deserts and high-climbing mountains. And then there was a time when a single religion dominated all the countries and, what is more, had for a long time its only centre in Rome.

Again, for centuries, Latin was the only medium of instruction in the European countries. The cultural unity of Europe is built on the basis of religious uniformity. The special characteristic of this religion is also unifying, *love being its central principle and service to humanity its supreme injunction.* Afterwards, the European countries outgrew the period of Latin tutelage and started evolving their own cultures through their vernaculars. But inspired by a spirit of co-operation, the different cultures followed similar lines and accumulated their achievements in the same treasure-house. The result is the western civilisation—the civilisation of intellectual co-operation in which numerous functions have been harmonised into one living organism. We often speak of Oriental civilisation but it is not based upon the intellectual co-operation of Asiatic countries. It is only non-European. Otherwise, the culture of Arabia is not only different from Chinese culture, it is in many respects antagonistic. Inwardly and outwardly, the culture of the Hindu in India is in sharp contrast with the culture of the Semetic in Western Asia. Their intellectual wealth has been stored up in separate treasuries. Lacking the cultural co-operation of the West, the history of ancient Asiatic civilisation is divided into different disconnected chapters. It is true here and there there have been some give-and-take due to forces whose explanation is to be sought in the facts of history; but the intellect of Asia has never assumed one organic form. So when we speak of Eastern civilisation, what we really mean is nothing more than our own isolated regional culture.

DON'T MISS

OUR

NEXT ISSUE

Send in your Renewal Promptly

The Post Card requires a Half Anna Stamp.

THE MANAGING EDITOR,

THE ALLAHABAD FARMER,

AGRICULTURAL INSTITUTE,

ALLAHABAD, U. P.

(INDIA).

DON'T MISS

OUR

NEXT ISSUE

Send in your Renewal Promptly

DEAR SIR,

I have been pleased to receive your complimentary copies of the *Allahabad Farmer*. Please register me as a regular yearly subscriber.

The first issue may be sent by V.-P. P.

Name.....

Address.....

.....

Signature.....

October, 1930.

ECONOMIC SURVEY OF MIRANPUR BASAHI VILLAGE, BENARES DISTRICT.*

B. S. Agarwala, Lecturer in Economics, Agra College, Agra.

Introductory.

Miranpur Basahi, a village in the neighbourhood of Benares city lying at a distance of about four miles from it, is divided into two blocks by a road passing north and south from Sindhora to Benares city. The village is attached to Benares tahsil for the purpose of collecting revenues, and forms a part of the Shiupur pargana with its police station at Orderly Bazar, near the courts. It is situated at a distance of about 2½ miles to the north-west of the Benares Cantonment station on the E. I. Railway.

The village is an ordinary type of its kind and can hardly claim to lead the life of self-sufficiency of the by-gone days, although the disintegrating forces have not had their full play as yet. It is becoming dependent more and more for its life-blood upon the neighbouring city, where most of the male members, including boys of eight to ten, go to work in mills and factories.

Boundary.

The village is surrounded on all sides by the cultivated areas of the neighbouring villages. On its northern side is located the village Lalpur, on its eastern side Anaula and Takhtakpur, and on the southern and western sides lie the villages of Sarsauri, Narainpur, Lachimanpur and Nawalpur in order.

Soil.

The village is in no wise connected with any river, forest or hill. The soil of Basahi, as judged by its productiveness, is wonderfully fertile and presents little variety. The surface of the village is flat, and the soil is generally alluvial in character. Of the total cultivable area of 193.45 acres, 57·12 acres have domat or deep alluvial soil; 36·42 acres have tal-matti or soil in the neighbourhood of tanks fit for rice cultivation; and the soil of the remaining 89·91 acres is light and sandy in character, and certain spots are porous and dry.

The Thee Purvas.

Basahi village can be divided into three distinct groups. The village is not a compact whole having all the houses centred at one place, but its inhabitants are divided into three *purvas*.

*Indian Journal of Economics—Vol XI, Part I, Page 56.

The first division which lies on the western side of the road is known as Ahirtoli, the place where the Gwalas live. The second *purva* lying on the eastern side of the road is known as Kunbian, where Kurmis predominate. This division is very thickly populated, and the houses are built very close together. On the far eastern side of the road lies the Chamartoli, the third division, inhabited by the Chamars exclusively, who lead a dirty life.

Number of Houses.

The number of houses including straw huts and *chappars*, but excluding thatched *ataries* from where the farmers watch their fields and temporary huts in the fields, is about 107. Besides these there are one *serai* and two small park gardens bounded by earthen walls. Of these, 68 houses are occupied by the Kunbis, ten by the Gwalas, fourteen by the Chamars, and the remaining fifteen by the Kayasthas, Gadarias, Nonias, Brahmans, Khattriyas Lohars, Telis, Nais, etc., each sect having one to four houses for itself.

Their Description.

There is a remarkable contrast—between the representative houses of the Ahirs, Kurmis and Chamars of the village. The houses of the Ahirs are less decorated and simple in style; tiles, straw and bamboo are the chief material for roofing, and the walls are made of soft soil. Some houses of bricks have been recently built, and in front of them beautiful though crude figures have been painted. The houses of Kunbis are smaller than those of Ahirs-suitable houses for pigmies to dwell in. These are very closely packed together. The Chamars being the depressed class of the Hindu society have poor and odd-looking huts to shelter them, and they seem to be contented with their lot. In all these houses the provision for ventilation is very defective, and they are so closely built that it is difficult to distinguish them from one another. Apparently there is no unsatisfied demand for housing, as many of the houses lie vacant, two Telis having recently left the village. There is some demand for housing accommodation in the Kunbian division, where the houses and huts are so thickly clustered together for want of space.

Distribution of Population.

The total population of the village, as estimated by actual enquiry, is about 629 persons—a figure slightly higher than the census figure of 1921. Of this total, 290 are Kunbis, 80 are

Chamars, 61 Ahirs and others 191. Their percentage is as under :—

		Population.	Percentage.
(1)	Kunbis	290	46
(2)	Chamars	80	13
(3)	Ahirs	61	11
(4)	Others	191	30
	Total ..	622	100

Civil Conditions.

The civil conditions of the village are fairly normal. The village women do not observe *purdah*, and the custom of widow marriage is prevalent in the village, specially among the low-caste people. There are few people who are left unmarried for marriage is deemed to be a necessity in India. The number of widows is limited ; only those remain widows who lose their husbands at an old age. The percentage of married men and women is fairly high, the reason being that child marriage is not discouraged. The average age of marriage is a little over eleven years, but cases are not wanting where the Kurmis of the village marry their children even at the age of two to four years. The Brahmans and the Kshattriyas generally marry their girls when they have attained puberty. The question of large dowries among these people is positively harmful, and needs to be discouraged. The following figures are suggestive. They show the distribution of the village population according to sex and civil conditions.

Distribution according to sex and civil conditions.

		Male.	Female.	Total.
(1)	Married	214	221	435
(2)	Unmarried	121	73	194
	Total ..	335	294	629

Agriculture (Area.)

Like all other villages of India, Basahi is an agricultural village. It comprises an area of 219 acres or nearly 315 bighas and 9 biswas. Of this total, 183 acres, or nearly 83 per cent. constitute cultivable area under different farmers. The remaining 17

per cent. is under common waste, and under *abadi* and *talabs*. Figures showing the distribution of land are as follows :—

How used.	Area	Percentage.	Remarks.
	Acres.		
(1) Under cultivation ..	183.45	83.45	About 20 acres were left as fallow land.
(2) Do. the *abadi* ..	13.37	6.0	
(3) Do. common waste ..	12.33	5.5	These are grazing grounds for cattle.
(4) Pastures other than common waste	Nil	..	
(5) Under the gardens ..	8.62	4.0	
(6) Wet-land area ..	1.89	1.0	This is under *talabs*.
(7) Dry-land area ..	Nil	..	Rains are sufficient and the Ganges is very near the place.
Total, Area ..	219.66	100	

A close scrutiny of the above figures gives us two most interesting facts—one about the occupation of the people, and the other about the density of population. Of the total village area of 220 acres, no less than 183½ acres are classified as area devoted to agriculture, of which nearly 20 acres lie fallow every year. This means that 163½ acres (or nearly ¾th of the village area), are under the plough. Agriculture is, therefore, the mainstay of the people, and nearly 50 per cent. of the people (315 out 629) are actually engaged in agricultural work.

Density of Population.

The uncultivated area comprises a small portion of land : it includes the *abadi* area, the common waste land and the pastures, the wet areas and the gardens. From the above table we find that nearly 13½ acres of land are reserved for habitation purposes. Within this space about 107 houses containing nearly 630 souls are built up, giving an average of eight houses to the acre, or nearly 47 persons to the acre. Each person has, therefore, on an average about 100 sq. yards of land to live upon revealing to us

the fact that there is no overcrowding in the village on the whole. It must however, be remembered that the Kunbian portion of the village is a bit thickly populated, showing a tendency for overcrowding in the future.

Other figures in the table need little comment. Some 13 acres are common waste land for the grazing of cattle, there being no pastures in the village. Also there is no dry area in the village, owing to the fact that there are ample rains ; and that the village is only five miles away from the Ganges river. The area under the gardens is about nine acres only.

Irrigation.

There are only eighteen wells in the whole village. Of these twelve are within the village *abadi*. These are used mostly for drinking, cooking and bathing purposes. The remaining six wells are either on the road side or in the fields and are used for irrigation. Besides these there are eight tanks in the village. The most important of these is the Bital Bhutt tank ; an artificially-made tank deriving its name from the present owner of the village. Other tanks are small and shallow, and get dried up in the summer. Hence these are unfit for irrigation purposes, except in the rainy season. The quantity of land irrigated with the help of these wells is about 114 acres ; the remaining 70 acres either do not need irrigation, or else they are left unirrigated. The wells of the neighbouring villages are also made use of by the people of this village for irrigating their fields.

Tenancy.

The village is held under permanent settlement, and the chief owner is Chhanu Jee Bhutt, a wealthy merchant of Benares city. He realises his revenues from his tenants and, in his turn, pays to the Government a fixed sum of money every year. Rents are mostly paid in cash, although sub-tenants sometimes pay in kind by giving half the produce raised by them. There are four classes of tenants in the village, and the total cultivable area of 18,336 acres is divided according to the tenancy rights as follows :—

	Acress.	Per cent.
Sir land	1.59	1
Occupancy tenants	73.98	41
Shikmi tenants	72.30	40
Fixed-rate tenants	27.94	15
Sub-tenants	7.55	4
Total ..	183.36	100

Size of a Field.

The total area under cultivation is divided into 530 fields. The area of the largest field is 7·33 acres, and that of the smallest field 1·100 acre, the average size being 3·66 acres. Jai Mangal Singh is the biggest landowner in the village, who cultivates about 16 acres of land. The fragmentation of holdings is a very prominent aspect of agriculture in this village. No less than 426 out of 530 fields are under one bigha in area. Thus over 80 per cent. of the fields are only small patches of land. The distribution of fields according to the size of a holding is as follows :—

	Fields.
Under 1 bigha ..	426
Over 1 bigha but under 2 bighas ..	92
„ 2 „ „ „ 4 „ ..	9
„ 4 „ „ „ 6 „ ..	1
„ 6 „ „ „ 8 „ ..	1
„ 8 „ „ „ 10 „ ..	nil
„ 10 „ „ „ .. „ ..	1
Total ..	530

Fragmentation of Holdings.

The above figures disclose a serious state of things. This extreme sub-division of holdings which is certainly deplorable, is chiefly due to the laws of inheritance of the country. The Agra Tenancy Act of 1926 has made some provision to effect exchanges of the plots of land so as to consolidate them into bigger plots to avoid unnecessary waste of time and money, but on enquiry it was found that the cultivators are not anxious to effect such exchanges. This evil of fragmentation gets still more intensified by the scatteredness of the holdings of a farmer all over the village, instead of their being concentrated in one spot. This evil deserves serious attention of every social reformer. Co-operation would be of immense help in solving this problem.

Need for Co-operation.

The example of Tharpur village in the Punjab is a living tribute to co-operation, and shows what co-operation has done in effecting the consolidation of holdings. Not only the number or the fields have been reduced from 844 plots, to 63 plots but their average area per plot has been raised from 4 kanals to 55 kanals.

Area Under Crops.

The Kurmis of the village raise mostly 'cereals'—rice, wheat, barley, maize and millets—the area under crops being 138 acres on an average per year. Pulses are grown as mixed crops. Garden crops, including sugarcane, potatoes chillies, etc., and fruit cover nearly 30 acres of the area. Nearly 20 acres are devoted to the production of fibre plants. Other crops are of minor importance. The statistical details about the crops are as under:—

	Acres.
Rice	39.22
Wheat	9.74
Barley	60.80
Wheat and barley	5.48
Gram and maize	22.73
Arhar and juar	21.11
Vegetables and fruits	20.68
Fibre plants	20.20
Sugarcane	13.84
Mixed crops	6.28
Other minor crops	6.19
Total, Area sown ..	226.20

It will be noticed from the above details that barley and rice are the two most important staple crops of the village, and wheat is grown as a subsidiary crop only. The total area actually sown is 220 acres, but the above figures are slightly in excess owing to the fact that certain crops are sown side by side in the same field. We have already seen that the total cultivable area is 183 minus 20 acres, that is, 163 acres only. Most of this area is sown twice in the year. Only a minor portion of land is devoted to the production of one crop in the whole year, and some to the production of even three crops in the year, as will be evident from the following table :—

One crop in one year raised on	19.7	acres or	9	per cent	nearly.
Two crops „ „ „	186.26	„	84.5	„	„
Three „ „ „ „	13.84	„	6.5	„	„

Insect Pests and Plant Diseases.

The crops raised in the village are subject to the danger of insect pests and certain plant diseases. There are certain pests that injure all crops alike, e.g., the white-ants. These begin their work as soon as the crops are sown. Sugarcane is the chief victim of white-ants. To combat this evil the villagers either smear the pieces of sugarcane with the solution of *asafoetida*, the smell of which keeps the white-ants away; or they spread cowdung on the edges of the field to keep the white-ants away from the sugarcanes; or they sprinkle ashes of burnt wood to render their teeth useless in eating. Then there are pests that effect particular plants. Thus the small and green pests known as Jhansi attack the vegetables in swarms and eat up the leaves. Ashes of burnt wood when sprinkled on the leaves disable these germs from eating away the leaves. Again there is a moth known as Chiduli that bores a hole in the stalks of plants, and goes on eating until the leaves of the tree begin to grow pale. The farmer tears the plant and throws the moth away. Rice is attacked by Karra which resembles a fly. It eats the leaves of the plants. The farmers do not know any remedy for this pest, except to drive it away again and again. The enemy of *sarson* (oil-seed) is Maho, a small green insect hardly visible to the eye. They cling to the plants from top to bottom and render them absolutely useless.

Plant Diseases.

Beside these insect pests there are several plant diseases. Wheat suffers from Girui which makes the plant pale and useless. Alsi suffers from Harda in much the same way as wheat. Kandaua affects barley turning the ears of barley black, so that when pressed with fingers, they get reduced to black powder. Millets suffer from Banjha on account of which there comes out a knot of folded leaves instead of an ear on the top of the millets. Gram suffers from Ukhta, which turns the plants dry altogether. It is deplorable that no regular methods to combat these ills are known to the villagers. They think that these diseases are caused by some defects of the atmosphere and of the land. It is extremely necessary to devise some means to fight these pests and diseases.

Implements and Manures.

The people of the village, being conservative in their habits are even today given to their old practices. Improved methods of cultivation are either unknown to them, or else they are not able to make use of them owing to poverty. The cost of production

has increased considerably in modern days, and even the most efficient farmer has to face real difficulties in producing and marketing his crops successfully. In most cases farmers have to lead a hand to mouth life. Generally speaking, the old types of ploughs and instruments are still used in the village although some farmers have begun to use better types of ploughs that leave a deeper and wider furrow.

Manures.

What is true of implements is equally true of manures. The traditional manures are used even today. All the filth and dirt of the village is deposited at one place and is left to decompose. This waste matter, and the dried and decomposed leaves of the trees, are the chief sources of manure in addition to the cattle-dung and urine. It is indeed unfortunate that nearly 50 per cent. of the dung is utilized as fuel instead of being used as manures. The modern fertilisers and manures are not known to the villagers, and even those who know their value find them to be very costly.

Livestock.

The livestock of the village is largely possessed by the Kurmis and Ahirs of the village. There are about 100 oxen, and bullocks, two-thirds of which belong to the Kurmis. The number of cows and calves is 45 and 61, respectively. There are 160 sheep, 24 goats, 50 rams and 2 horses. The details are given below :—

	Ahirtoli.	Kunbian.	Total.
Oxen	17	61	78
Buffaloes	18	3	21
Cows	22	23	45
Calves (of cows and buffs)	23	38	61
Goats	24	Nil	24
Sheep	160	Nil	160
Rams	48	2	50
Horses	Nil	2	2
	Total	..	441

Poor Feeding.

The livestock of the village is poor both in quality and in number. Animals are not capable of doing strenuous work. They are ill-fed and ill-cared-for. The arrangements for supplying fodder for cattle are wholly inadequate. Their ordinary diet is a mixture of *khali* and *bhusa* in water, but only the rich are able to provide these in sufficient quantities. There are no regular grazing grounds or pastures kept for the purpose of feeding cattle.

Cattle Diseases.

The cattle of the village are subject to certain peculiar diseases, the most common of these being the Chabha, which produces swelled lumps in the necks of cattle. Lime is used to cure it. Sometimes swelling in the stomach also appears, which is treated with the solution of a newly-grown bamboo plant. Wounds also appear under the yoke ; to cure these kerosene oil and phenyle are made use of.

Occupation, Trade and Transport.

Occupations.

As already stated, the main occupation of the village people is agriculture. Of the 629 persons, no less than 315 or nearly 50 per cent. are engaged in agricultural pursuits. The rest of the persons are either children or dependents, or pursue some other calling. People also combine certain other subsidiary forms of occupations with agriculture. A certain number of persons are engaged in petty posts such as the qanungo, the patwari, the teacher, and cooks and bearers. The gadarias, the potters, the blacksmiths and the barbers carry on their usual trades as of yore. In Ahirtoli the *gwalas* carry on the work of supplying milk in the city, in addition to their agricultural operations on a small scale. Most of the young men of this part have now taken to painting lorries, motor cars, carriages, etc., for want of any other suitable occupation. The industrious Kurmis still carry on their agricultural pursuits to a large extent, although a few of them have recently taken to the painting business. There are also one or two petty shop-keepers in the village who supply mostly tobacco, salt, cheap grains, etc. Some of the village people have opened shops in the Orderly Bazar near the Benares Kutchery. In Chamartoli some 12 families of the Chamars, one of a potter, and two of basket-makers live. The potter makes earthen pots, and the basket-makers prepare baskets for

village people. But the Chamars of the village now mostly serve as cooks and bearers to the European officials in the Cantonment and their wives work as ayahs to the European children.

Industry and Trade.

On the whole the people of the village are industrious. The Kurmis are diligent, honest and hardworking, but the Ahirs possess dirty habits and are great cheats. The industry and trade of the village is on a very limited scale, and hardly needs any mention. The old village industry of hand-spinning and weaving is not at all practised in the village. Other industries such as those of the potter, the carpenter, the basket-maker, and the blacksmith, etc., are carried on only to meet the needs of the village people. Since the industries of the village are in a state of backwardness, the means of transport are naturally undeveloped and old fashioned, although there is one pucca road connecting the village with the city and the railway stations. Most of the daily needs of the village people are supplied by the neighbouring village of Bhojubir lying at a distance of about half a mile from the village under investigation. It is, therefore, well connected with markets; although the means of transport are wholly inadequate and primitive by nature.

Handloom Spinning and Weaving.

The Charkha movement of Mahatma Gandhi did awake the villagers to the need of starting and developing the spinning and weaving industry as far as possible, and the majority of the people at once took to the occupation in 1922, but with the downfall of the movement the industry was altogther given up. There are no weavers in the village to continue the industry. Moreover, the Moti Cotton Mills, which lie close to the village, besides supplying plenty of work to the labourers, supplies them with quite cheap and decent cloth for their daily needs. Hence there is no scope for this indigenous industry to thrive so far as this village is concerned. Again, the soil of the village is not suited for growing cotton, which is the chief raw material to work upon. This is an additional reason for the neglect of the industry in the village.

Need for Co-operation.

To maintain our cottage industries in an efficient manner the spread of co-operation is absolutely necessary. It is, however, deplorable to note that few people, if any realise the benefits of co-operation in developing our home industries. If the various trades and industries be started on a co-operative basis, there can be hardly any doubt for their success in the future. By this

means the people will learn the lessons of self-help, honesty, fellow-feeling and thrift. In the long run they will be able to earn larger incomes, and thus raise their standard of living by and by. The failure of the movement in the United Provinces is largely responsible for turning away the minds of the village people from its adoption. The true spirit and principles of co-operation have not been rightly understood by the people, and the lack of character of the members is one of the chief causes of failure of the movement. The illiteracy and ignorance of the people gave occasion to the dishonest secretaries and supervisors to mislead and deceive them. These facts account for the failure of the movement, and the loss of faith in the societies.

Trade and Transport.

The trade of the village consists primarily in the scale of foodstuffs, and chaff produced in the village itself. Sometimes the whole crop is sold at the village field, but mostly it is taken to the markets in the neighbourhood for sale. The village people being generally illiterate and ignorant have not the tact of a business-man, and hence fail to get as much as they ought to. Generally they carry their crops to the market in bullock carts, on pack-animals, or on their heads, as may be convenient for them. The trade and transport of the village has been carried on in the old style for centuries with a few minor changes here and there. The trade in milk, ghee, dungcakes, wood-fuel, earthen pots and wooden goods is carried on a prettly large scale in the village, and the proceeds from the sale of these things are in some cases quite sufficient to meet the needs of the village requirements at the present day in India.

Co-operative Maketing.

The methods of co-operative marketing, and of purchase and sale would be of great help in securing fair prices for the cultivators, and in providing them with cheap raw materials and instruments. Moreover, the profits of the middle man would be eliminated altogether, and the farmers would be the gainers to that extent. Also many other wastes incidental production and sale would be avoided to the advantage of the village people.

Labour, Wages and Indebtedness.

Labour and Wages.

The labourers of the village are mostly engaged in ploughing, sowing, irrigating and other similar operations connected with agriculture. The wages are paid partly in kind and partly in money. There are some labourers who keep their ploughs and bullocks to let them on hire system to the zamindars and big *kashtkars* who do not own them, and are paid at the rate of Rs 2, both for his labour and for the hire of the plough and the bullocks for a day's work. Some of the villagers keep their own ploughs and bullocks, and hire workers to handle them, and also to do other agricultural works in the fields. The labourers are paid in money, and receive a small quantity of *chabena* every day. Some labourers are paid monthly, fortnightly or weekly, with some quantity of grains as agreed upon. One striking feature of the village is that women are employed to work on the sugarcane fields whereas this work is done by men in other places. These women generally earn two annas per day, and a small quantity of *chabena* in addition to the money wages. The general rate of wages in the village is eight annas a day for adult labourers. Some *chabena* and *gur* is also granted for their daily breakfast.

Savings.

The income of the labourers is not so great as to enable them to make any savings, nor are they frugal by habit. Thrift is something foreign to their minds, and they lead a life of abject poverty. There are, however, some families that save whatever they possibly can. Bansh Narain, Ram Newaj Daftary, Tulsiram, Ramdass and a few others are able to save something. Much of their saving is in the form of ornaments for their family; and the little amount of money saved by them is kept buried underground, as there are no banks in the village to encourage savings in the form of deposits.

Indebtedness.

Most of the village people are under heavy debts, which they are not able to pay off. The farmers need tools and seed and bullocks for their agricultural work. For this they are obliged to borrow money at high rates of interest. Then they have got ceremonial and domestic expenses. Some money is needed for these too. As there are no *mahajans* in the village, people borrow money from the city *sahukars* Babu Rághubir Singh of Ishwarganj,

and Munnilal Kalwar and Dwarika Nonia of Pandepur. A debtor borrowing Rs. 14-4-0 has to pay Rs. 20, in twenty instalments of one rupee each, *hundi* system is also in vogue. The rate of interests is 20 per cent. to 24 per cent. per annum, compound interest. Farms of the fixed-rate tenants are sold on *rahan*, the rate being Rs. 100 to Rs. 150 per bigha according to the fertility and the Government revenue of the land. According to the *rahan* system a debtor pays 10 per cent. to 12 per cent. per annum compound interest. Only one debtor, Raghunandan Kurmi, has liberated himself from indebtedness through his ability and hard work. The illiterate villagers are quite ignorant of the usefulness of the Co-operative Credit Movement in solving the problem of indebtedness. There is no common fund, permanent or temporary, for any common good whatsover. Even the *takavi* loans are not availed of by the village people to meet the seasonal expenses in connection with their agricultural work.

Sanitation, Education and Administration.

Sanitation.

As already stated, the houses of the village people are old-fashioned, low and ill-ventilated. People are very dirty by habit, and collect heaps of dirt and waste matter here and there without discrimination. The drainage system is entirely defective, favouring the multiplication of insects like mosquitoes which are the chief source of malarial fever. The paths in between the houses are very narrow, hardly allowing one man at a time to pass through them. These paths are mostly used by the villagers as urinals, at great disadvantage to their health. The atmosphere outside their houses is rendered foul by the heaps of refuse and cowdung that are left to decompose to be used as manure for their fields. It is highly desirable to deposit this waste matter in pits away from the dwellings, preferably in their own fields or near them.

Wells and Tanks.

Wells are indiscriminately used both for bathing and drinking purposes. They generally take their bath by the side of the wells, spill much water, which owing to defective drainage system, is left to stagnate, and serves as a breeding-place for mosquitoes and other insects. People also go to take their bath in the Basai tank where *dhobies* also come to wash clothes. This practice needs to be discouraged.

Epidemics and Diseases.

The village has not been visited by any epidemics like plague or cholera for the past three or four years, although seasonal diseases, like malaria, do make their appearance. The great enemy of humanity—tuberculosis—is fast making its home in the villages, to check the spread of which sanitary measures are absolutely necessary. It is sad to note there are no doctors or hakims near the village to give medical help when needed. People generally go to the hakim at the Orderly Bazar in cases of ordinary illness, but in serious cases they go to the Government hospitals in the Benares City.

Generally women do not observe *purdah*, but some *purdah* high-caste people have it in their families. This produces a bad effect on the health of the ladies by checking their activities. Early marriage too has got a detrimental effect upon the health of the married couple. Both these practices need discouragement, as children born of such parents are bound to be weak and puny.

Education.

The people of the village are not well-educated. Only four or five per cent. of the people know how to write their names and there are only three persons who know some thing of the English language. There is a great want of education in the village, but the people are quite indifferent towards it. It is said that there was once a primary school in this village, but now it is no longer in existance. However, at about a distance of a mile from the village, there is a primary school at Bhojubir, where the children of the village go to read and write. They are mostly given education in Hindi and Urdu vernaculars. One boy of the village attends the Vernacular Middle School at Shiupur, about two miles from his home. Two other boys read at the London Mission High School, one of whom has appeared at the High School Examination. The average period of school life of the village children is low, and may be roughly estimated at about five years.

The following table gives the details about education in the village :—

Name of the School.	No. of students.	Caste.	Class.
Bhojubir Primary School ..	2	Ahir	Darja A. and B.
Ditto. Ditto. ..	2	Kaystha	Do. A. and B.
Ditto. Ditto. ..	1	Kurmi	Do. A.
Shiupur Middle School ..	1	Kaystha	Do. 5th.
London Mission High School.	2	,,	One sat at High School Examination.

The others have received English education. One has passed S. L. C. and is now a clerk in the Queen's College, Benares; one is the village patwari, and the third is employed by a contractor of the Benares district board. People are generally poor, and cannot afford to pay the fees. Female education is quite unknown in the village. Some efforts are necessary to improve the condition of the villagers by imparting education of an elementary character to suit their needs. *Lack of education is the chief cause of their backwardness.* It would be desirable to introduce compulsory elementary education for the village children, and to open night schools for the grown-up.

Administration.

The history of the village is a very obscure one. Only this much is known that it was founded by a Milki Mohammedan, and is now under the permanent settlement. This administration of the village is carried on the *panchayat* system. "Village Unions" are in existence, each having five or six villages under its control. The *panchayat* system has been introduced only recently, and there was no such system in existence till November, 1925. This system has, unfortunately, not worked quite satisfactorily till the date of the enquiry. Not a single case was decided by it till then, although the *panches* and the *sur-panches* had been duly elected by the Government, with the help of the village people. There is one *sur-panch* and six ordinary *panches* in every union.

The Mukhia.

Before the establishment of these unions, cases were decided mostly by the *mukhia* of the village, who acted as the judge in consultation with four or five other respectable persons of the village. This *mukhia* was not nominated by the Government, but was selected by the village people themselves. Thank God, there is not much of litigation in this village, owing to the peaceful nature of the inhabitants.

Conclusion.

In conclusion it may be stated that the village people are, on the whole, quite happy, but they would be happier still if the following improvements were gradually introduced in the village for their benefit:—

1. The introduction of elementary education.

2. The teaching of the lessons of thrift and self-help and the spread of the true co-operative spirit.
3. Improvement in the sanitation of the village.
4. Improvement in the methods of cultivation, and the introduction of supplementary industries.

All these improvements could be made only if people were to understand rightly the principles of co-operation, and bring them into use to ameliorate their condition economically, morally and socially.

THE RIDDLE.

Once upon a time death took by the arm a great Eastern ruler.

Now the dead man bequeathed all his wealth to his son.

This youth, who had seen but sixteen summers, hastened to taste of those richer pleasures which a wise parent had denied him. Possessed of extreme beauty and much intelligence, he found that all the fruit upon the tree of his desire was his but for the plucking.

Only one dread came to disturb the soft, licentious laziness of his existence. This was the fear that perhaps his life would end while it was still young.

So great was this obsession, that he bade his steward send out into the world to discover the four wisest among men.

"And I shall demand of them," he said, "What I must do to live until I wish to die. And for him that gives the wisest answer there shall be a great reward."

On the appointed day, these wise men came before the Prince.

No sooner had he told them his perplexity than the sages, at once and altogether, commenced to offer their opinions, so that the air was shrill with learning.

The Prince calling upon them to cease, ordered that each should answer in his turn, according to his age.

"Sire," said he whose beard reached almost to his feet, "I have lived, a hermit, all my days alone with thought. If you would reach an age as great as mine, then let your life be holy in the eyes of God and He will grant you your desire."

The Prince turned to the second.

"And you?" he asked.

"Why," said the wise man, "this fellow is but a simple fool. For it is clear to all that to live long one must live sinfully, as the Lord, having then no longing for his company, will be in no hurry to summon him away."

Now up leapt the third.

"Sire," he cried, "they are brainless idiots both. Only by knowledge can you ensure longevity. Devote your days to learning and to books, and death will stay his hand out of respect for such a reservoir of wisdom."

"Piffle," cut in the fourth, "If it is proof your Majesty desires, then here it is. A dead donkey is a sight unknown. So spare your brain from work of any kind, and be content to eat and sleep and do those things that gratify your senses; then, donkey-like you never need fear death."

Now the young Prince, greatly perplexed and distracted, slipped away to walk upon the sunlit terrace where he might think in peace. So absorbed was he that, descending the great marble steps, he failed to notice the skin of a banana, tossed there by a certain lovely baggage from her window up above; and stepping upon it he slipped and fell and broke his neck.

WHY I CAME TO THE AGRICULTURAL INSTITUTE, ALLAHABAD.

By Nirmalkanti Sen.

From my very early boyhood I had a mind and an interest to learn agriculture. When I was a school-student, I was wont to think and believed that every man in this world, however insignificant he might be, has something to do. He is a part and parcel of the world, rather of the universe, and if he does not add something memorable to the store of the universe, then though its collection of memorable works may be a very magnificient, precious and holy one; still it will never be a complete one. I also believed that each and every person can shine at least in one profession or other of life. God has bestowed upon him necessary power, if not sufficent, by which he can play his part well in the theatre of life. It seems to me that if a man does not succeed in his life career, it is because he does not exercise fully the gifts and powers which the Almighty has conferred upon him. I was influenced by these ideas and thoughts. By and by a problem arose in my mind, "What sort of education should I pursue, so that I may not pass my life in vain"? From that time onward I began to think seriously about it in order to solve the problem. I thought about it for several months and at last came to the conclusion that I must study Agriculture. This was my early conception.

As days went by I came to know the pecuniary conditions of the farmers of our land—their sorrows and sufferings—the importance of agriculture—its condition and the scope for improvement. The census of 1921 reads that out of a total of 247 millions of people in British India, 178 millions are agriculturists, i.e.,

72 per cent. of the people are directly employed in agriculture. Sir John Strachey says, "It is probable that 90 per cent. of the whole population in India are so closely connected with the land that they may properly be called Agricultural." Then again, agricultural production is the basis of many of the important Indian manufactures, *i.e.*, the development of most of the Indian manufactures are co-related with the improvement of Indian agriculture. The purchasing capacity of Indians depends on agricultural production. If they can produce and sell the maximum amount of goods with the minimum amount of labour and capital, then they may be able to purchase more goods manufactured in India by Indians and thereby can help Indian manufacture. The foot-hold of Indian export and import trade also rests upon Indian agriculture. Imports depend upon our capacity to export and the purchasing capacity of the Indian agriculturists. So we see that during famine it is not only the export trade which suffers but also the import trade. The financial condition of the Government of India depends upon India's agricultural prosperity. In a year of famine, due to inadequate monsoons, the Government finances are considerably reduced due to expenditure on famine relief and a fall in the Government revenue. The said reasons clearly point out that agriculture is at present the most important single industry in India and will remain so for many years to come. The prevailing agricultural condition of India is very poor and it may be said that nothing has been done in this sphere, when it is considered what could be done by the help of modern science and machinery. It is also true that so long as the educated and intelligent people of India will not put their sons into the agricultural profession, their fate will be darkness, sorrows, and sufferings caused by under-feeding and famines.

The other reasons as to why I wanted to get an agricultural education are as follows:—

(1) For the sake of acquiring knowledge ;

(2) To start an agricultural farm and to manage it profitably;

(3) To teach the farmers of our locality better and modern agricultural farming ;

(4) To write and publish agricultural books, bulletins and magazines, if possible;

(5) To earn my livelihood ; and

(6) To put emphasis on starting agricultural experimental farms along modern lines as a solution of the present problem of unemployment, especially of the so-called educated young men of India.

There is no agricultural college in Bengal, Assam, and Bihar and Orissa, except the Imperial Institute of Agricultral Research at Pusa where post-graduate students, only, may carry on with their study. For me and many other students of those provinces there does not exist ample or necessary facilities for learning agriculture in these provinces. However, I came to know the names of eight agricultural colleges in India through the "Royal Commission on Agriculture in India." The names of those colleges is given below with the reason or reasons as to why I did not try to get admission to them except one:—

1. Agricultural College, Cawnpore:—In the rules for admission of students, not domiciled in the United Provinces to the College, I found:—

(*i*) Students are admitted only on the recommendation or at the request of the local Government or Political Agent concerned.

(*iv*) In addition a fee of Rs. 1,500 per annum will be charged per student to the local Government or the Indian State concerned.

(*v*) No student not domiciled in the United Provinces will be admitted to the exclusion of qualified United Provinces students."

2. *Agricultural College, Coimbatore.*—Students are required to pass the Intermediate Examination in Arts or Science. As I had passed only the Matriculation Examination I did not attempt to join the college.

3. *College of Agriculture, Poona.*—Students not domiciled in the Bombay Presidency are required to pass the Intermediate Examination in order to get admission to the college.

4. *Agricultural College, Nagpur.*—I did not apply to this college for admission, because the expenses of the students not domiciled in the Central Provinces are rather heavy and preference is given to the students of the province at the time of admission.

5. *Agricultural College, Lyallpur.*—I wrote to the Principal to send me a copy of the prospectus of the college. He replied that the prospectus can only be had on producing seven annas as its price. Accordingly I sent him the money; but, to my wonder, he simply returned the money.

6. *Khalsa College, Amritsar.*—I did not apply for admission to the college due to it being situated at a considerable distance from our province, Bengal, as well as others also.

7. *Agricultural College, Mandalay.*—The qualifications for admission to the college are partly given below :—

"(*ii*) A good knowledge of the Burmese language, both spoken and written, is essential.

(*iii*) Candidates must have been born in or domiciled in Burma."

I do not know a bit of the Burmese language nor was I born in or domiciled in Burma.

8. *Agricultural Institute, Allahabad.*—I tried to get admission to the college due to the following main reasons :—

(*a*) I was qualified, according to the prospectus of the college, for admission and students of no province are given preference.

(*b*) The expenses of the students at the college are rather moderate.

(*c*) There is an opportunity for the students of the college for self-help. They may earn a part of their expenses by working at the college.

A NOTE ON THE ERADICATION OF KANS GRASS.

By M. Vaugh, B. Sc. Ag., A. E.

The subject of eradication of *kans* grass is one that has received much attention in India on the part of Agricultural workers. It has been generally recognised that the country method of digging up the root and separating it from the soil by hand involves a larger expense than the value of the reclaimed land will usually justify. Attempts at eradication of *kans* by the use of steam cable plowing outfits or tractor outfits have usually taken the form of attempts at deep plowing. Experiments on such plowing have usually assumed the necessity of plowing to a depth of 8 inches and have usually recommended plowing up to ten or twelve inches to ensure anything like complete eradication. These attempts have usually been made in the dry weather and have been generally successful in so far as the removal of the grass was concerned. They have, however, usually involved the expenditure of large sums on equipment often exceeding rupees one lakh and this extremely high expenditure has limited the application of this method. So far as I am aware the only serious attempt of which the results are published by other methods than deep plowing has been that of Mr. Howard of the Indore Experiment Station.

Mr. Howard's method involves the cutting of the roots at a depth of about 8 inches by the use of special adaptation of a common type of ridging plow. This is worked by bullocks and is reported

by Mr. Howard and others to have given satisfactory results in so far that the *kans* has been removed with reasonable effectiveness. So far as I know up to now all of the efforts made have involved the use of special machinery usually costing a comparatively high price when the work accomplished is considered and in general the equipment so required has not been useful for other kinds of work after the eradication of the *kans* is completed. Large cable plowing outfits have not been generally adapted to agricultural conditions in India and so far as I know the specially adapted implements used by Mr. Howard are utilized for no other purpose. If the cultivator, either a large zamindar or a small cultivator, could be assured that the same equipment could be effectively used for cultivation after the removal of the *kans* I think the chances of inducing him to purchase the equipment would be considerably improved. The use of the large steam tackles necessarily pre-supposes very large areas, on the other hand, the use of the small bullock outfits proposed by Mr. Howard limits their use to comparatively small areas. So far as I know no extensive effort has been made to secure a medium size outfit which could be worked by an ordinary 15—30 size tractor and the equipment for which could if possible be used for cultivation of the reclaimed plots afterwards. I therefore suggest that a series of experiments be organized on the following lines and for this specific purpose. The purpose of the experiment to be first a comparative test of the economics of eradication for deep plowings, by the use of an implement patterned on Mr. Howard's recommendation, and ordinary implements adapted for use in cultivation after the reclamation of the land is complete and secondly a testing of various types of ordinary implements and methods of their application to determine which is the more effective implement and what is the most effective and efficient method of employing it. I suggest that the source of power employed should be a tractor of approximately the size know as 15—30 horse-power of some standard make well known and on sale in India. For the implements to be used with it I will suggest that the following implement be selected.

For the deep plowing trials a plow of the type known as a brush breaker or grub breaker should be tried. Along with it an ordinary type of two-bottomed mould board plow might be tried. though I doubt the ordinary type plow being sufficiently strong to stand under the strain of such heavy work. I consider that the test of the brush breaker type for deep plowing will be mainly for the purpose of economic comparison of costs. Undoubtedly this type of plow will break up the soil to the required depth and will in all probability effectively eradicate the *kans*. The use of it, however, will be slow and expensive and I seriously question

whether it will be adapted to ordinary agricultural uses after reclamation of the land is complete. So far as I am aware the method proposed by Mr. Howard has not as yet been adapted to use with tractors. The bullock power type of implement used by him is neither large enough to economically utilize the power of the tractor nor is it strong enough to stand the strain which would be impossed on it by the tractor. It would, therefore, be necessary to develop an entirely new implement suiting the purpose. I will suggest that experiments in this direction might profitably be started by utilizing parts of the standard listers used in America in the dry semi-arid regions of the west. These lister bottoms are similar to ridging plow bottoms used as a basis of Mr. Howard's recommendation. They would have to be mounted in a suitable manner several of them together and possibly suitably stiffened. This work might be carried out by manufacturers in America, by the dealers in India or in the workshop of the Agricultural Engineer to Government, Cawnpore, or possibly in the workshop of the Agricultural Engineer, Allahabad Agricultural Institute. They would need be carried out under the supervision of some one experienced in such work and where suitable facilities are available. This again is likely to result in an implement which is suitable for this one purpose, but not for general cultivation, though it is possible that it may be used in other ways for shallower cultivation at some reduction in efficiency.

Certain work carried out at the Agricultural Institute has led me to believe that there is a possibility of accomplishing the reclamation of such land by other methods and with tools that are commonly used in ordinary cultivation work. In order to do this it will be necessary to carry out the reclamation procedure at the most suitable season of the year rather than as a hot weather operation. Observation of several fields infested with *kans* leads me to believe that propagation is at least as much from seed as from underground roots. It is also a well-known fact that any plant deprived of its leaf surface will sooner or later die. It seems likely that a procedure can be worked out by which the plant can be repeatedly cut back in such a way as to eventually kill it. Experiments have been carried out at the Agricultural Institute with the disc harrow and with the harrow plow, but these are not quite conducive because the land had been worked to some extent before the experiments were started. It seems probable that if the land is thoroughly plowed and cross-plowed with a harrow plow just at the beginning of the rains when the soil has been somewhat soft, but not completely soaked all plants can be cut off below the surface of the ground and that a monsoon crop can be immediately planted. This work should be done partly with a skimming plow and partly with a disc harrow

to determine which gives better results and will do the work more cheaply.

It should be recognized that one operation will not complete the job of reclamation. It will be necessary to again cover the field thoroughly at the end of the rainy season or shortly after the *kharif* crop is harvested. However, a crop of some value may be secured during the first season, which may largely pay for the cost of the work done during that season. The land should again be gone over thoroughly at the end of the rainy season and again before the rains are well-advanced during the next season. If the grass makes considerable growth betwen the *kharif* harvest and the beginning of the following rains it may be desirabe to give one more working if there is sufficient moisture in the soil. It would be desirable to plant some *rabi* crop such as gram or barley. The same procedure should be followed the next year; that is, thorough working to cut off all leaf surface just at the beginning of the rains and again at the end of the rains. It will probably require two years or possibly three years to complete or approximately complete the eradication. Experience leads me to believe, however, that no serious difficulty will be caused by the grass after the first season and it seems probable that cultivation can be carried on regularly hereafter. The tools that are used for the reclamation work can continue to be used for cultivation afterwards. The cost per year will not be large as the ground is covered rapidly and effectively. Probably in most cases one or at most two plowing with the skimming plow will suffice for any one operation. This will cost from Rs. 3 to Rs. 3-8-0 per acre per operation.

THE EUROPEAN HONEY BEE IN INDIA.

By J. S. Baldry.

After five years practical research work, the European honey bee (*Apis Mellifica*) has been successfully acclimatized, and established in India.

India being one of the few countries where beekeeping on modern lines has not been developed, I came out solely to experiment both with Indian and European bees.

After may trials with Indian bees (*Apis Indica* and *Apis Darsata*) I have not found them a practical proposition, owing to their migratory habits, and poor honey gathering qualities.

Many tests have been made, and attempts to hybridize Indian and European bees have not been successful. This has also been the experience of beekeepers, in Japan and China, to which countries *Apis Indica* is also indigenous. Modern beekeepers in

all parts of the world, farming bees extensively for commercial purposes, use the European bee.

Much study and patience has been necessary in accomplishing results up to the present time. Owing to the long journey overseas, special methods of packing, and travelling had to be investigated, so that bees arrive at their destination in best possible condition, this could only be done after trial consignments had been sent, and observations taken at this end, as to the probable causes of failures, thereby errors being eliminated. A system of packing has been evolved, by which bees travel exceptionally long distances and arrive in excellent condition.

My bees have now been in India over 20 months and are now passing through the annual life cycle of bee activities, for the second time in this country, and should be well-acclimatized, for they are now in a healthy and prosperous condition.

A most important factor, that is, the rearing of "European Queen Bees" has been successfully accomplished in India, and are now mothers to the strongest colonies in my apiary.

All honey gathered has been of fine quality equal to any imported honey, I have sampled in India; which means that it will compete on the market with other fine honies, from any part of the world.

Although the average yield of colonies of bees last year was 30 lbs. of honey per colony, this is by no means a test of the real possibilities in India (I took 60 lbs. of honey from one colony).

It is probable, that there are locations more suitable to beekeeping, than where my experiments have been carried out.

The great variety of conditions in India, both climatic and topographical, make a tremendous field for further research work, in connection with beekeeping.

Irrigation of large areas of country now being developed is again a very important factor, in the possiblities of beekeeping.

My experiments have been carried out at Nasrapur, Poona district. Altitude about 2,000 ft. Annual rainfall 60 inches, Temperature Fall. Max. 100°. Min. 36°.

I should say a fair average agricultural district, would describe this locality. As a spare time industry to the farmer, beekeeping is considered a most profitable occupation, requiring less time and attention than other agricultural work, in comparison to benefit gained.

Before progress could be made with beekeeping, some means of teaching the ryot would have to be instituted, either through agricultural or other educational institutes, as some knowledge is necessary, for the management and behaviour of the honey bee.

Eventually beekeeping may be carried out as a whole-time commercial industry, as carried out in other countries; and some idea of possibilities may be given, from authentic reports and statistics.

		Value.
		£
U. S. A. produces	90,000 tons of honey, per annum	2,000,000
Canada „	10,541 „ „ „ „ „	580,000
New Zealand exports	1,253 „ „ „ „ „	75,000

Taking countries in similar climate to parts of India, Jamaica exports 5,000 tons of honey annually, while other islands of the West Indies, produce proportionate quantities.

The Hawaiian or Sandwich Islands produce large quantities. The Sandwich Honey Company alone, own 10,000 colonies of bees on these islands. To use the words of the manager of this company (Mr. Oswald Gilbert). "For the first seven years we were the joke of Honolulu, that there was money in honey production was beyond the dreams of the average islander." Not so now, for one of the richest bankers of Honolulu owns a chain of apiaries on these islands.

European bees are used in all cases.

It is desirable to mention why the European bee is necessary to make a success of beekeeping. Owing to the long, and severely cold winters of Europe, the honey bee has the instinct to hoard up a great amount of honey, as food, to support them during the time when flowers are not available, in doing so much more is gathered than is actually needed, and therefore the beekeeper is able to take the surplus for his own use and profit. The Indian and other bees of tropical countries, have not the instinct to store surplus honey, to anything like the same extent, for having for ages past, been able to live from hand to mouth (so to speak) and this coupled with the migratory habit, has not cultivated the instinct to store up large quantities of honey.

It is hoped these European bees now established in India, will prove to be the nucleus, of an important and profitable industry to the people of India, and that ways and means will be found to teach people to become skilled apiarists, for undoubtably, thousands of tons of honey go to waste in India annually, owing to the lack of bees, and the knowledge requisite in Modern Beekeeping.

IMPROVEMENT IN CIRCULATION.

We beg to thank those interested readers who have recommended The *Allahabad Farmer* to their friends. Every month new names are added to our mailing list, and the amount of correspondence received leads us to believe that this Institute and magazine is serving a need in India.

In a country so large as India, and in other countries there must be thousands of people who would welcome our magazine in many ways. It will be realised that it is practically impossible for the editor to get in direct touch with these, but, no doubt, around your district you could make known this publication.

Where the agriculturist is, the Magazine should go. Can you help? Send us some names of likely relatives and friends. We will gladly send them a copy free of charge. Don't delay, send in the names now.

DON'T MISS THE NEXT ISSUE!

SEND IN YOUR RENEWAL NOW.

TO

The MANAGING EDITOR,
The Allahabad Farmer,
AGRICULTURAL INSTITUTE,
Allahabad, U. P., India.

Date.....

Kindly send me the next four issues of the *Farmer* from above date The cost may be sent to my address per V. P. P. or invoice in foreign countries.

Name .....

PLEASE WRITE IN BLOCK LETTERS.

Address .....

.....

FILL IN THE FORM.
POST IT NOW!

Subscriptions, India, including postage, yearly Rs. 2.
Foreign, one dollar or four shillings.

Signature.

WHY NOT BECOME

— A —

SUBSCRIBER

TO THE

Allahabad Farmer?

DON'T DELAY

MAKE USE

— OF —

THIS FORM NOW

SIMPLE SEPTIC TANK CONSTRUCTION.*

Mason Vaugh, B.Sc. Ag., A. E.

The people of the world are gradually realising that the problem of disposing of human fæces is of great importance to the health of the human race. Several of the most deadly diseases of mankind are contracted only as a result of the ingestion of micro-organisms voided with the fæces. The old time methods of diluting sewage by dumping it into running streams, and that of exposure to sunlight and air, can only be used safely where the population is scant and moving. Where people are relatively concentrated, some better method of handling and treating these products, to render them harmless, must be used.

The sewerage of a large city is a problem in itself, and considerable advance toward a solution of this phase of sewage disposal has been made. This paper will deal with the smaller installation required to care from one family to a village. Especial attention will be paid to the problem where running water is not available or must be used sparingly.

The method of using vessels which are periodically emptied into a pit, and the material covered over with dry dirt immediately, is probably safe if carefully carried out; but it seems practically impossible to get it done in such a way that the material is not an attraction for flies and animals. The procedure is unpleasant to both the user and to the one who cleans the vessels; it offends the senses of sight and smell; and, perhaps worst of all, it depends on the constant services of a person. Ancient India very wisely realised that the person who cleaned these vessels is unclean as a result of such work, but, instead of showing him how to cleanse himself, set him apart as permanently unclean and forced his family to share his uncleanness. Thus we have the sweeper, whom we must pity, and whose condition we must improve if possible.

A sewage disposal system, to be usable, must be convenient to use; it must remove the excreta with the least offence possible, and it must dispose of it safely. The septic tank, so called, seems to meet these requirements better than anything else at present available. It is adaptable, easily worked, and effective. The principle on which it works is that, under suitable conditions, bacteria will liquefy any organic material reducing it to liquids and gases for the most part. The residue, not liquefied, will be an inert, inoffensive material. The conditions are a suitable temperature, between 40 and 125 degrees Fahrenheit, darkness, not

* A Paper, based on a practical demonstration, given at the January, 1930, meeting of the United Provinces Branch of the C.M.A.I., Allahabad.

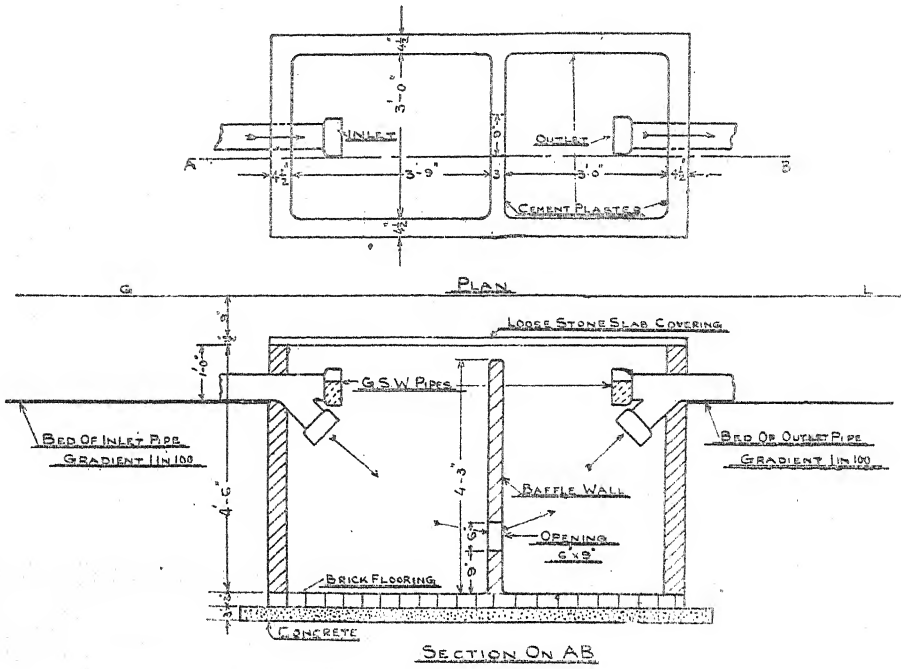


Fig. 1,

PLAN FOR A TEN USERS' SEPTIC TANK.

too much agitation, not too much oxygen, and time. In temperate and tropical countries these conditions can be easily secured by having a tank underground and large enough to hold at least a full 24 hours' accumulation, into which the excrement is delivered immediately, and which is kept full—as much treated sewage being discharged as fresh sewage is added. Figures 1, 2 and 3, show three variations of this system.

There is no standard design of septic tank. Almost anything meeting the above conditions are usable. Common practice has agreed that the tank should preferably be at least twice as long as it is wide, and that the depth of sewage in it should not be less than 3 feet, and preferably $3\frac{1}{2}$ or 4 feet. The tank should be water-tight, so that the liquid level may be kept constant, and so that when necessary, the material may be disposed of at some distance. Within these conditions, almost any masonry material may be used for building the tank. Concrete is good, but unnecessarily expensive in India. Good brick, laid in mortar composed of three parts sand to one part cement, will be the most satisfactory material in most places. Such construction should be plastered inside with the same mortar. The covering of the tank may be reinforced concrete, stone, reinforced brick, or any

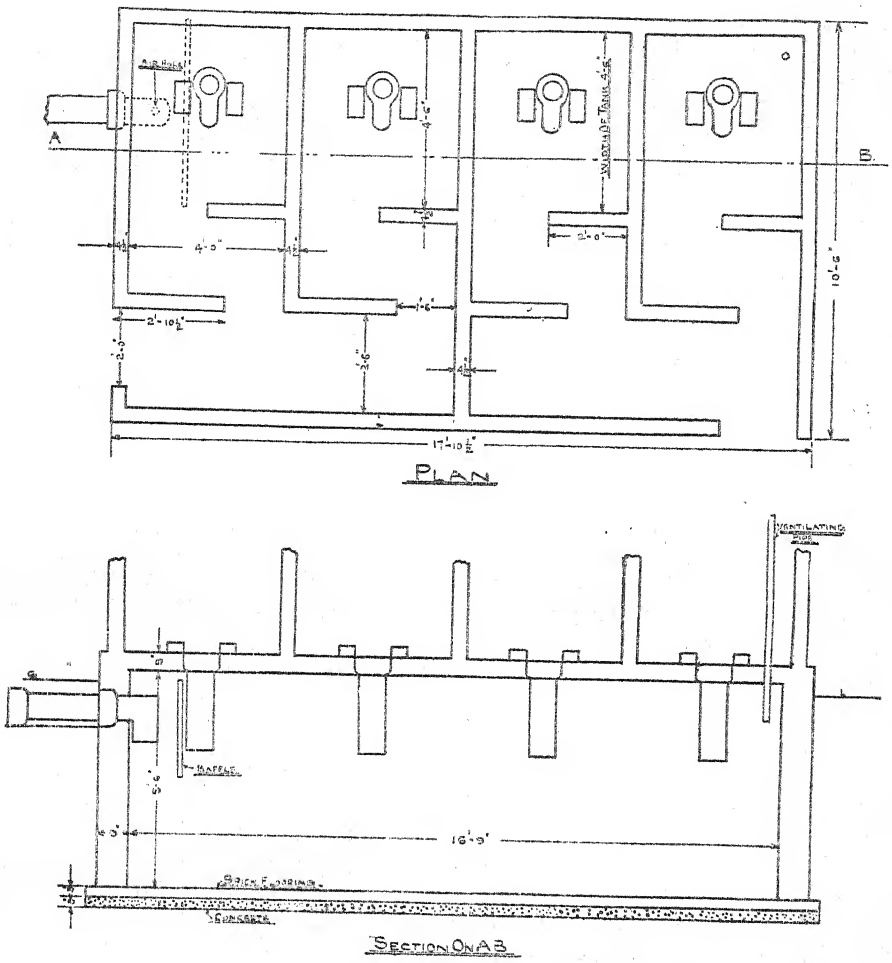


Fig. 2.

PLAN FOR A SIMPLE SEPTIC TANK.

other convenient material sufficiently strong to support the earth covering. Where well-constructed, walls 4½ inches thick (half a brick) are quite sufficient—at least for small tanks designed to serve one bungalow.

There are many and varied types of septic tanks, each designed to have some special advantage. Experience seems to indicate that excessive complexity is at least unnecessary. The essential thing required for the successful operation of the digestion process is one chamber in which it can go on relatively undisturbed. One or more baffles, to prevent agitation due to incoming sewage, may be useful. These may be of stone or concrete slabs,

walls just near the inlet and outlet; or they may be nothing more than a thin curtain wall across the tank, dividing it preferably into one-third at the outlet end and two-thirds at the inlet end. This should have in it a hole, 9 inches to 1 foot square, near the floor and near the centre of the tank, to allow easy passage of the sewage from one end to the other. Since there is no pressure on this wall, it need not be thicker than brick-on-edge (3 inches, plus thin plaster). As indicated in the three figures, the inlet and outlet can be constructed in various ways. The essential thing is that the sewage should enter under the surface and leave from

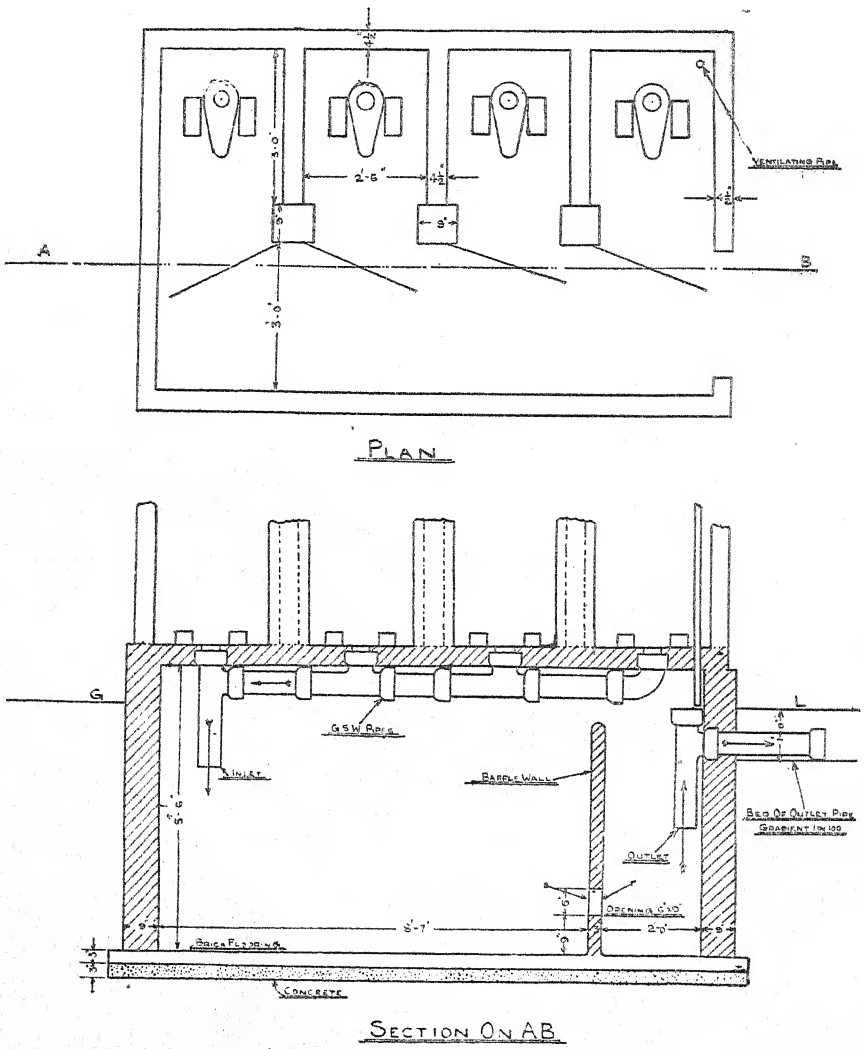


Fig. 3.

PLAN FOR A SIMPLE FLUSH LATRINE.

under the surface, because usually a fairly heavy scum gathers on the surface of the contents of the tank which should not be disturbed. If this material enters the outlet, it is likely to seriously clog the disposal pipe. Both inlet and outlet must be ventilated. If elbows are used instead of tees, small holes must be drilled in them to permit the passage of air.

The necessity, or otherwise, of a second chamber in the tank depends on the method of ultimate disposal. In my opinion, there is never any necessity for a third chamber in India. There are three methods of disposal which may be adopted. Under favourable conditions, the discharge may be into a ravine or watercourse. This is applicable under hill conditions, where the watercourse in question is not used for water-supply for some distance below the discharge point, and especially if the ravine is heavily wooded. I should not approve of discharge into a plains river as a matter of principle. The water may be used for irrigation of crops not eaten raw by human beings. For this, it is necessary that the source of sewage be sufficiently above the ground level where disposal is to be effected, to allow the second or storage tank to be entirely above ground. This condition will exist in cases where there is a slope, or where the sewage source is above the ground floor. The storage tank may be of less depth than the digestion tank, which must be of a certain minimum depth, mentioned above, for good digestion conditions. It is, of course, possible to have the storage tank lower than ground level, but this involves pumping, the apparatus for which is expensive if automatic, and likely to be unsatisfactory if dependent on a servant for constant attention. In considering the use of the effluent water for irrigation, it should be remembered that such use will involve balancing the demand for water and the supply. If the area irrigated is larger than the septic tank effluent will care for, additional water can often be supplied. Also it must be remembered that the septic tank does not 'purify' sewage. It merely liquefies the organic matter. This liquefaction depends on the continual growth of bacterial life, which breaks down the organic matter to secure food for its growth. Certain types of protozoa which are feeders on bacteria are usually associated with septic tanks, and, since their feeding is not selective, they eat pathogens and non-pathogens impartially. This undoubtedly results in some reduction of the probability of infection from the sewage: but the two things the septic tank does toward purification are breaking down the organic matter in a way that prevents a nuisance, and making it unattractive to flies. Being unattractive to flies, the chance of infection is materially reduced. It is perfectly possible to utilise sewage for irrigation, provided the supply is enough to justify the trouble, and provided that there is a reasonable

amount of intelligent supervision of the servant doing the work.

The use of the effluent for irrigation is mainly a proposition for schools and large institutions. For individual bungalows, especially where the soil is at all sandy, the most convenient disposal is in underground absorption pipes. These should be laid 1½ to 2 feet below the ground surface, and on a slope of 1 inch in 10 feet. So-called drain tile should preferably be used. I have had tiles moulded by local potters, but, they have not been conspicuously successful. It is possible to get moulds and make cement drain tile, if the clay ones are not available. The tile should be 4 inches in diameter and 1 foot in length, and should be laid with only moderately close joints. A bit of grass, paper, or other material over the joint, to prevent sifting in of dirt until the fill over the pipe has time to settle, is advisable. Care should be taken to see that the tiles are laid on an even slope and that they are not displaced in filling the trench. The latter should be dug only to the correct depth. If the ground is sloping and uneven the tiles may be laid on a contour or curved, to suit conditions. The length of tiles necessary will vary. At my own bungalow, around which the soil is sandy and where four people are using the bathrooms regularly, the tank has only about 75 feet of tile. American practice recommends 50 feet per user: but this need not be followed in most cases. In sandy soil, 150 to 200 feet will usually be quite sufficient. A smaller amount may be installed, and, if found insufficient, more may be added. The tiles need not all be in one line; several parallel lines may be used. It is desirable that the absorption line be laid a little below the outlet level of the tank, and that first 10 feet, if possible, be of sewer tile, with cemented joints, laid on a slope of 3 to 4 inches in 10 feet. Absorption cannot be absolutely instantaneous; in the early morning, when the commodes are flushed frequently, more water may be sent into the absorption tile than it can dispose of immediately. Accumulation for an hour or two, provided it does not exceed the capacity of the pipe, and so disturb the level in the tank, will not do any harm. If, due to the slope of the disposal area, the absorption tile comes too near the surface, a section of glazed tile with cemented joints, and at a greater slope, may be inserted to again carry it to a lower level. The slope of the absorption tile should not be increased. The tile may be put under a lawn, fruit garden, or near a hedge, provided the trees or shurbs are not such as grow with their roots under water, as willows. It may be put under a vegetable garden, but I do not consider it desirable to grow roots eaten raw near the tile. While the danger is small, precautions are desirable. Absorption [illegible]s to care for school and hospital installations

should each be designed according to specific conditions.*

Lack of a pressure water-supply deters many from installing such systems. For bungalows using flush commodes, water for flushing is essential: about three gallons of water is required to flush once. For ordinary use, a 40-gallon steel oil drum filled daily will be sufficient for a commode. It is comparatively easy to arrange for a *bhishti* to supply this amount. In many cases a small hand pump may be installed. While a pumped supply is certainly desirable, if the sweeper is put to carrying water it will not require an increase of staff and will give increase comfort and convenience to occupants. A tank must be provided somewhat above the commode, but three or four feet is enough. If the roof is flat, the bathroom roof is a good place.

For schools and hospitals, tanks of the type illustrated by Fig. No. 2 can be worked with only the water which the people take in their *latas*, and a couple of bucketfuls to wash down the floor daily. We have one which has been working so for several years without difficulty. It serves 25 to 30 people. This type is recommended only for use by the most primitive people, and where the amount of water used must be extremely small. Where slightly more water can be afforded, the type illustrated in Fig. No. 3 is to be preferred as giving less odour and as working somewhat better. One of this sort has also been working for some months, with only a couple of bucketfuls of water morning, noon and evening to flush it out. This is carried from an adjacent faucet by the sweeper. Of course, it would be better to have this connected with a water-supply and to have an automatic flush, but this is not essential for reasonably satisfactory operation. It is not claimed that latrines of these types are absolutely free of smell. It is claimed, however, that they are much better than the ordinary bucket latrine in this respect, and that they are much more sanitary. They do not eliminate the sweeper, but they do improve his lot by removing the most unpleasant part of his task. They do eliminate the fly practically completely.

The cost of such things is always a factor. School latrines can be built—septic tank and all—for about Rs. 125 per seat as an average figure. Of course, costs will vary. For bungalow commodes, the cost will vary with the quality of fittings used and the plan of the building and site: Rs. 175 to Rs. 200 for one commode only, under favourable conditions, is about the minimum. Five to six hundred rupees would be about the minimum cost for a 3-commode installation favourably located in one bungalow, and

* The author, who is the agricultural engineer at the Allahabad Agricultural Institute, Naini, E. I. R., will be glad to give all the assistance he can, in the desigining of bungalow, schools and hospital septic tank installations, to any reader who may ask for such assistance.—ED.

using good quality low tank commodes. If much piping must be used, either for supply of water or for connecting commodes to tanks, the cost will be proportionately increased.

THE COMMON POULTRY TICK.

By I. P. Caleb, B. Sc. (Hons.) M. Sc.

Ticks are well-known for the trouble they cause to certain domesticated animals. The mouth-parts are adapted for biting as well as for sucking blood. They insert a pair of organs known as *chelicerœ* into the skin when they suck blood. These organs have recurved teeth on them which enable the parasites to fix themselves firmly to their host.

The common fowl tick is known as *Argaspersicus* and belongs to the family Argasidæ.

The body is oval and flattened dorso-ventrally. It is slightly pointed towards the anterior end. The colour varies from light brown to dark brown. Males and females are very much alike, except that the latter are slightly larger. The average measurement of an ungorged female is about 8 mm. in length and 5 mm. in breadth. They expand about 3 mm. all round when fully gorged.

Both sexes are covered by a smooth leathery skin. A few shallow pits can be seen on the dorsal side of the body, especially two oval pits towards the head in the middle line.

During the day the ticks become very inactive and sluggish. They remain hiding on the walls and roof of the poultry shed. They have also been found under the bark of trees growing close to the shed. This habit of theirs makes it difficult to get rid of them. Often the poultry farmer does not even know their existence, though his fowls suffer from the effects of their bites. At night, however, they suddenly become active and attack the birds. They often have to go a long distance to find a host. If carefully watched, one can see scores of ticks climbing the poles to the roost from where they get on to the fowls.

The damage done by these pests is great. Once a tick attaches itself to a fowl it does not leave off until it is fully gorged. It takes a tick from three-quarters of an hour to one hour to engorge itself, after which it looks like a bean seed. This shows that when dozens of ticks get on to a single fowl, the amount of blood lost by the bird must be considerable. A fowl that has been attacked by ticks becomes very weak and does not lay eggs regularly. It usually suffers from diarrhœa.

Besides this, *Argaspersicus* has been found to be the carrier of certain diseases. Fowl Spirochetosis is a fatal disease and its spread has been attributed to the tick. In India a *Spirochete* worm known as *Spirochæta gallinarum* is carried by *A. persicus*. Fowls show signs of disease a week after they have been bitten by infected ticks. Diarrhœa and disinclination to feed are the first symptoms. A kind of drowsiness comes over them and they are sometimes seen lying listless on the ground with their feathers ruffled. The comb takes a pale yellowish colour and the birds begin to get convulsive fits after which they die. In some cases the legs and wings get paralized, and the fowls grow thin till they die in about ten days or a fortnight. Their blood gets full of *Spirochætes* and are carried to the liver and spleen, which gradually become function less and atrophy. Sometimes a fowl may recover, when the *Spirochætes* disappear from the blood during the convulsive attacks. A tick once infected is able to transmit the disease for about six months.

The life-history of *A. persicus* is simple and easy to study. Reddish eggs can be found in the cracks and crevices of the fowl-house. Each female lays several hundred eggs. About a month after the eggs have been layed, six-legged larvæ hatch out. Metamorphosis is complete. The larvæ are active and attack fowls during the day as well as at night. They cause severe irritation when sucking blood. They fall off when fully gorged and crawl away to hide. After a week the larvæ cast their first moult and the nymph thus formed has a fourth pair of legs. This creature is more like the adult. It feeds at night only. The second moult takes places after about ten days, and again a third after a week or so. The last moult brings it to the adult stage.

To control these pests, the fowl-house should be kept clean and free from rubbish. Roost poles should be made of smooth wood, without cracks in it. All crevices should be sprayed with kerosene oil at least once a week. Boiling water may also be used. Walls should be wiped with a rag dipped in kerosene or sprayed. It is advisable to throw away and burn all old nests occasionally. Trees round about and inside the poultry yard should be examined by pealing off bits of bark.

In order to make permanent mounts and to study the mouth-parts of ticks under the microscope, the skin and other tissues have to be removed. This can be done by placing a tick in a 10 per cent. solution of Sodium hydroxide in water for about 48 hours. All the soft tissues will dissolve and only the chitinous mouth-parts will remain. These may be dehydrated and mounted on a slide.

In cases where the tick has to be removed from the body of a host, care has to be taken that the mouth-parts which are embed-

ed in the skin, are not injured. A drop of kerosene oil on the tick and skin of the host will make the parasite relax its hold.

SHEEP IN INDIA.

W. J. Hansen, B. S. A., M. Sc.

The observations made on the indigeneous method of sheep husbandry have been limited largely to the local environment of Allahabad. India being such a vast continent, many variations are bound to occur from those herein recorded.

The sheep appear to be kept on grazing only. The sheep thrive accordingly as the grazing is of good or inferior quality, and of sufficient quantity. During the summer months when the weather is extremely hot, the sheep do not graze for many hours during the heat of the day, but take rest and seek the shade. At nightfall, on account of the danger of predatory animals, the sheep are brought into fold. It can be said that even when the pastures are adequate, the sheep do not secure sufficient hours of grazing for their requirements, during at least six months of the year. During the cold season, it is a different matter. Night grazing offers good possiblities if a dog-proof fence can be erected around the grazing area. This however, is not practical when sheep are continually on the move from place to place. For folding at night, a fence of thorns and brush, a couple of feet wide and six feet high, has been used successfully by many villagers. Aside from grazing, no Gadarias, to my knowledge, make provision for a reserve of food. Thus when a scarcity of grazing comes along, the shepherd either sells his sheep, buys fodder at high prices or allows his sheep to fall off in condition and in many cases to die.

In the Indian flock, the Gadaria (shepherd) makes no attempt to regulate the breeding of his flock. In the first place he is so ignorant he just believes that everything is the result of fate and that it does not do any good to try and interfere with the working and pleasure of the gods. The law of the jungle prevails—the survival of the fittest. Nature does not select along the lines that breed a good leg of mutton or a high yield of fine quality wool. Nature's selection is primarily one of constitution and resistance to disease. The rams are allowed to remain with the ewes throughout the year. This practice cannot be too strongly condemned. There is no control or record of breeding and everything is very haphazard. For the United Provinces, the Civil Veterinary Department recommends that the best time for the ram to enter the flock is in September, remaining until December. This makes

the lambing season February and March, a good time for rearing and weaning of the lamb. The Gadaria should also be discouraged from attempting to get more than one lamb a year.

The Gadaria also shears his sheep about three times a year. The wool is so short that its commercial value is materially lessened. Two clippings a year, March and September, should be advocated.

Dipping sheep is not practised among Gadarias. It is too costly, although advantageous. Docking of long tails is not practised. The process is simple. The stroke of a knife and the application of some ointment. Further there is no system of marking or numbering flocks, no record of progeny, no record of the wool clip. The Indian Gadaria rather than treat a sick animal will dispose of it to the butcher. The Indian shepherds are a very ignorant, superstitious and obstinate class of men. They represent the greatest stumbling block to the advance of the sheep industry in these parts. His lot can only be improved by demonstration and education.

At the present time there are no Government sheep breeding stations in the United Provinces and practically nothing is being done to help local breeders in the improvement of the sheep Industry. Co-operative Societies might well turn their attention n this direction in an endeavour to effect some improvement.

EXTRACTS.

Neglect of Sugar Industry in India.

One of the most important agricultural industries of India, namely, sugar, has been allowed to be virtually ruined owing to the apathy of the Government. Some steps have been taken to revive it by the Agricultural departments in the principal sugar-producing provinces, but the steps taken are wholly inadequate to the needs of the situation, as will appear from the fact that the imports of sugar show no falling off ; on the other hand, the quantity of imported sugar has been increasing. It competes with no British industry, and it cannot be said that any vested British interests stand in the way of its development. Sugar is one of the most important articles of food and it is nothing short of a scandal that an agricultural country like India, which possesses agriculturists second to none in the world, should be dependent to such a large extent for this commodity on foreign imports. Those interested in British trade with India deplore the low purchasing power of people and urge the necessity of increasing it. If this industry had been protected, fostered and developed, India would not only

have been supplying her own needs but also exporting large quantities of sugar to other countries. The economic condition of the people would thereby have been appreciably better. For years past the attention of Government has been drawn to the deplorable condition of the industry and to the need of vigorous action to enable it to compete with Java sugar. But the reports of sugar production from year to year reveal a continuous state of stagnation. The representatives of the Bombay Sugar Merchants' Association, who were examined the other day by the Tariff Board, pointed out that India had annually two to three million acres under sugarcane cultivation an acreage which no other country in the world possessed, yet it had to depend upon other countries for the bulk of its requirements of sugar. They rightly complained that Government had done practically nothing to encourage or develop the Indian sugar industry and that 'the valuable recommendations of the Sugar Committee were lying idle.' Among other things they recommended that part of the sugar duty should be utilized for encouraging the indigenous industry in the shape of bounties and advocated the establishment of schools where training in sugar chemistry, technology and engineering should be given and that model farms and factories should be attached to them to enable teaching staff to carry on research work.

LEADER.—*Sept. 17th*, 1930.

HIDE AND SKIN INDUSTRY IN INDIA.

CESS COMMITTEE'S REPORT.

'In point of importance this entire hide and skin industry is one of the most important phases of India's economic life. Its annual gross value runs into as many as 40 to 50 crores of rupees. It not only gives employment to large number of men but is a factor in the economic well-being of millions of India's depressed classes. Any action taken for its improvement will automatically, though, perhaps gradually, help to better their lot. They are among the unorganized and silent submerged strata of the population and have a legitimate claim of the Government's active sympathy.' In these words the Hides Cess Enquiry Committee appointed by the Government of India on the 28th September, 1929, emphasise in their report, the importance of the Government looking at their report for the betterment of all branches of this industry.

The committee, which dissented on many points, has unanimously recommended the creation of a permanent Cess Committee whose functions should be restricted to the problems of *improvement of raw stock* and an organization for handling it both in India and abroad, for the improvement of Indian raw stock, leather goods and allied manufactures. They have proposed a constitution for the Cess Committee which they hold does justice to all the interests concerned, namely, the primary producer, the hide and skin dealer and the commission agent, the exporter, the tanner, the shipper of tanned goods, the departments of the central and local Governments which will be concerned with the Cess Committee's activities and the Indian States. The report warns the Government against disturbing the delicately poised structure proposed for the Cess Committee.

There is a great deal of difference of opinion as to funds needed for the purpose but all the members are agreed that Rs. 5 to 7 lakhs a year will enable the Cess Committee to make a good start and that at the rate proposed the export cess on raw hides and raw skins will yield this amount, but if additional funds are required they should be obtained by raising the rate of cess, provided that the interests concerned are consulted as to the value of the results achieved and express willingness to accept the enhancement of the rate. Per contra, if the review of the committee's work proves the need for a reduction of the rate of cess, it should be reduced.

The report further suggests that, instead of resorting to legislation, the Governor-General-in-Council should be empowered to change the enactment of the Indian Legislature. The committee say: 'On that part of our reference which deals with articles and the rate of cess the following are our considered conclusions :—

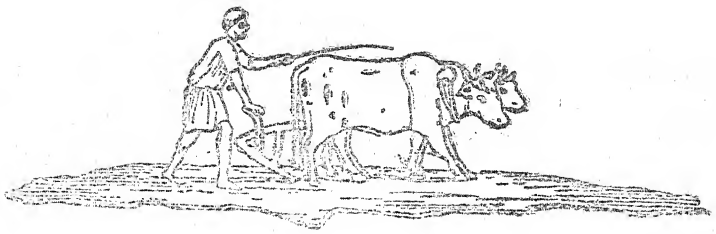
(1) The rate of cess should be one per cent. *ad valorem;* (2) the articles which will be cessed should be raw hides and raw skins ; (3) the cess should be on export cess, namely, levied on these articles when exported ; (4) the cess should be levied according to the existing export duty schedule of tariff valuations, revised annually as at present by an independent authority. We further recommend that the rate of cess proposed by us should be reviewed after sufficient experience has been gained of the working of the Cess Committee.'

METALS FOR DAIRY MACHINERY.*

REPORT TO DAIRY MANAGEMENT COMMITTEE BY MR. DEWALL, S. H.

Tinned copper, the most widely used material for dairy equipment in all the countries visited, has the disadvantage that the tin coating becomes worn away, leaving a bare copper surface open to contact with the milk or cream, with resulting possible deterioration of the dairy product. Copper alloys, such as monel metal and silveroid, are not desirable substitutes for tinned copper, although often useful for traps and junctions. Aluminium is especially suitable for large holding-vats for milk or cream, and for milk-tubing, but satisfactory results will only be obtained if the metal is free from impurities. It is more resistent to corrosion in the worked form than in castings. Its softness renders it unsuitable for cheese-vats or for milk cans. Experiments are being carried out in the U. S. A. on an alloy of Al and Mn. which has the requisite strength for milk-cans. Aluminium equipment must not be cleaned with caustic soda or ordinary washing-soda, in both of which it dissolves freely. A safe cleansing agent can be made by the addition of ordinary water glass to the washing-soda solution. Nickel is proving useful for dairy equipment. It dissolves to some extent in milk, but produces no serious effects on the flavour. It loses its bright luster after a time. Stainless steel has in some cases given satisfaction, but experience has been so variable, owing to the effect of slight differences in the mode of fabrication, that it cannot be recommended for dairy equipment. The chromium-nickel steels are almost completely resistant to the action of milk and its products, and have given satisfaction in a number of large dairies in the U. S. A. It seems probable that these materials will ultimately replace tinned copper or enamelled steel for many types of dairy equipment.—*Author's summary.*

*New Zealand Journal Sci. & Techn. 11 (1) : 14-25. fig. 1929.



EDITORIAL COMMENT.

Butterfield* and The Reconstruction Unit.

The village problem is being more definitely recognized as more than a one man problem to be tackled singly by the Evangelist, the teacher, the social service worker, the co-operator, the medical practitioner, or the local governing bodies. Butterfield brings to India the idea of Rural Reconstruction unit—a collection of 15—20 villages in a particular centre, where all the agencies at work take stock of each other and work out a broad constructive program.

* * * *

Agricultural training for village padres and teachers.

It may be said that a great deal of the failure in village movements has been due to a lack of understanding of the fundamental agricultural problems on the part of the rural worker. A rural worker must necessarily have an agricultural bias. It has been seen that religious teaching that does not also cope with the problems of satisfying the economic needs of the peasant is largely lost so far as the villager is concerned. Every village padre, teacher and inspector of Co-operative Societies needs and should have a sound agricultural training before embarking upon his village career. The Agricultural Institute is admirably situated and equipped to train village workers so as to give them effectiveness in the work.

* * * *

Impediments to rural progress.

The impediments to rural progress are ; poverty, disease, and illiteracy—and of these illiteracy or ignorance may be said to be the root of superstition, fear and lack of measures to combat disease, etc. The problem clearly lies in the hand of the rural teacher, extension worker and local authorities.

---

*Report of a Conference on Rural Work, April, 1930.
National Christian Council, Poona

Every School a Social Service Unit.

Social service is the noblest of all the services that can be rendered to humanity. The need for it is very great in India where all around us we find so many social evils. Education among the masses, female education, uplift of the depressed classes, the spreading of ideas of sanitation, hygiene, physical culture, better ways of life and rural reconstruction— these are some of the most important problems that we have to tackle.

Happily, the idea is gradually gaining ground with universities and smaller educational institutions that social service should form a part of their curriculum and several such institutions have even started social service leagues of their own. Do you belong to a Social Service League ?

* * * *

The Golden Rule.

Let us remember the Golden Rule—a rule that has universal acceptance regardless of colour or creed—"Love thy neighbour as thyself and do unto the other fellow as you would have him do unto you."

Correspondence service.

We will be pleased to acknowledge letters from our readers on any agricultural problem. If we do not have what you want, we will probably be able to advise you where you can get it. In the case of any queries sent in that will have interest to other readers, the replies will be inserted in the columns of the *Farmer*. Feel free to use our service.

Employment service.

During the year, we have received a great many requests for trained men in Dairy and General farm practice. A great number of students upon graduation have been placed in this way. Prospective employers are requested to get in touch with us as to their needs.

* * * *

Co-operative Milk Societies Unions in Bengal.

Discussing the position of milk supply in Calutta and Bengal, Mr. N. N. Bose, Officer-in-charge of Co-operative Milk Societies Unions in Bengal, in an interview stated recently that there were 104 societies affiliated to the Calcutta Co-operative Milk Society Union and the working capital upto June 30 was Rs. 2,80,000. The Union began in 1919 with a supply of half a maund of milk daily to its customers. The supply has now increased to 150 maunds of milk a day. The sale proceeds of milk last year amounted to Rs. 6,08,000. The Union suffered a loss of Rs. 5,000 in the first year of its working. Losses have been completely wiped out and the Union has year by year been gradually increasing its profits so that last year it earned a net profit of Rs. 26,000. The Union has built up a reserve and other special funds which today exceed Rs. 80,000 on which it can safely rely in a lean year. It annually spends out of its profits Rs. 1,000 in aid of schools where children of members generally receive education. It also contributes liberally towards welfare work among the milk producers. It has sunk 25 tube wells and distributed 20 stud bulls, organized four cattle breeding societies and encouraged the cultivation of fodder crops by free distribution of seeds. Till 1926 the Union used to boil a portion of the milk received from its affiliated societies and to sell the boiled and raw milk to its customers. The method was undoubtedly crude and unscientific. The Union has therefore set up a model milk factory in Calcutta after the designs furnished by the Imperial Dairy Expert to the Government of India. The success of the Calcutta Milk Union has led to the foundation of five more milk unions in Bengal notable among which is the Darjeeling Milk Union for the moment primarily a creamery society. The Union is putting up a dairy factory working on the grovitution system, which will be the first of its kind in India.

* * * *

A Suggestion to the Old Boys.

It is now six years since the Indian Dairy Diploma and the Intermediate Diploma in Agriculture courses were started at the Agricultural Institute and during these years something like one hundred students have passed out. It will not be out of place to suggest that we arrange to meet one another once a year at the Institute,

so as to get re-acquainted with each other, thus expanding our circle, and to exchange our views on agricultural subjects. It will be a fine thing for all the past students to meet each other again and a good opportunity to meet the present students and staff of the Institute. It will be a sort of "old boys" gathering of both the courses. This gathering can well be utilized in discussing methods and ways to further our prospects all round. If this, my humble suggestion, is accepted I will request my friends both Dairy and Agriculture men to intimate their names. Upon having a fair number of boys join with me, the date and month of gathering will be settled by consultation. I would request all to join hands in this to make the gathering a success.

Before I close I would request every past student to subscribe to the *Farmer* and to help in increasing the mailing list of subscribers, pertaining to all the problems, troubles and hardships each of us is facing in our daily toil in Dairy farming.

Kindly correspond with :

D. H. ANJARIA, I. D. D.,
Manager, Dairy and Poultry Farm,
Baria State, Devgad, Baria, P. O.,
(Rewa Kantha).

EDITOR'S NOTE:—

The Institute authorities are in agreement with the above noted policy and will do everything possible to the make re-union a success. Do your bit—Get together !

* * * *

Congratulations: Kedarnath and Gajindra.

During the year, we are pleased to note the successful adventure into Commercial Dairying of two of last year's Dairy graduates, Kedar Nath Gupta, and Gajindra Singh.

Kedar Nath with a capital of one lakh rupees has started at Hyderabad, Deccan. Gajindra is already selling ten maunds of milk a day in the Model Dairy—Lahore. We wish both of these men a continuation of their good success. We are expecting that their enterprising initiative will be an encouragement for other young Indians to embark upon Dairying as a career.

* * * *

Congratulations.

We extend our heartiest congratulations to Mr. L. Anand Lal Sah, I. D. D., former student of the Institute upon his successful completion of the N. D. D. course in England. He is now trying for the N. D. P., and Diploma in Agriculture. We wish him the best of success and trust that he will find many years of useful service ahead of him in India upon his return.

IN MEMORIAM

We, the students of the Allahabad Agricultural Institute and also the members of the Staff, have come to learn with great sorrow the sad news of the decease of one of the best students in this Institution, Mr. A. T. Dass.

We shall now miss among us a student who was exemplary in his character and a good sportsman.

We wish to convey to the members of his family the fact that we all share with them in their sorrow at his departure, but we also wish to offer our condolence to the father and mother who naturally feel their loss more than any ony of us. We shall also pray that God may comfort them in their sorrow.

THE INDIAN SUGAR INDUSTRY

Book Review.

Khan Bahadur S. M. Hadi, Director of Agriculture, Bhopal State. (F. W. Petch, Thacker & Co, Ltd., Bombay.)

This book is composed of 290 pages including a short appendix. In eighteen chapters the author deals with the Sugar Industry of Bhopal State. He covers the Agricultural aspects of soil and climate, and describes the indigenous system of cultivating sugarcane in Bhopal State. Of the Indian seedlings tried at Bhopal, S 48 is reported to have done the best. The trials with the other seedlings are discussed. He stresses the need for exact information regarding the manurial requiremeuts of this crop. Two chapters are devoted to describing and discussing the indigenous end certain improved methods of *gur* and *rab* manufacture. A chapter covers the processes of white sugar manufacture. The last half of the book details the statements of experiments in manufacture of white sugar direct from cane at Sugar Research Station, Nuzhat Afza, Bhopal.

This book, in many ways a progress report, commends itself to the critical attention of the student and those interested in the problems of the Sugar Industry.

W. J. H.